

JPRS-ULS-89-009

7 JULY 1989



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# ***JPRS Report***

# **Science & Technology**

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***USSR: Life Sciences***

# Science & Technology

## USSR: Life Sciences

JPRS-ULS-89-009

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7 July 1989

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UDC 635.21:631.52

**Search for Solanum Sp. with Resistance to Phytophthorosis and Virus**

18400241a Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 5, Sep-Oct 88 (manuscript received 14 Oct 86) pp 40-42

[Article by K. Z. Budin, V. A. Kolobayev and N. A. Zhitlova, All-Union Scientific Research Institute of Plant Breeding imeni N. I. Vavilov, Leningrad, and All-Union Scientific Research Institute of Plant Protection, Leningrad-Pushkin]

[Abstract] Since phytophthorosis and infection by virus Y constitute factors responsible for significant losses in the potato crop, interspecies hybridization studies were conducted to breed new potato hybrids displaying enhanced resistance to both agents. Determination of resistance was performed with seedlings, largely  $B_1F_1$ , exposed to both pathogenic agents. Tabulated data are presented on the results, showing that this approach appears to be quite promising in selecting plants with combined resistance. Among the most promising donors of phytophthorosis resistance were *S. simplicifolium*, *S. demissum*, and *S. stoloniferum*; while *S. chacoense*, *S. andigenum*, *S. vernei*, *S. stoloniferum*, and *S. simplicifolium* contributed to resistance against the Y virus. References 8: 5 Russian, 3 Western.

UDC 633.12:631.52:632

**Morphological and Biological Traits of Buckwheat Used in Breeding for Resistance Against Fungal and Viral Diseases**

18400241b Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 5, Sep-Oct 88 (manuscript received 10 Feb 87) pp 45-49

[Article by Ye. S. Alekseyeva, V. K. Shevchuk, and T. Ye. Shevchuk, Kamenets-Podolskiy Agricultural Institute]

[Abstract] Phenotypic monitoring was conducted on buckwheat to assess morphological and biological features that may be related to enhanced resistance to attacks by fungal and viral pathogens. The 6-year study involved the analysis of 2,900 samples of cultivated and wild-type buckwheat. The results showed that breeding of buckwheat for resistance to fungi should be based on stomatal counts on the upper epidermis of the leaf, which should not exceed 75 stomatas per  $1 \text{ mm}^2$  of 0.25-0.29 percent also showed greater resistance to fungi than plants with lower concentrations. Finally, plant hairiness was a positive factor in resistance to viral infections, largely due to the fact that insects serve as viral vectors and colonization of hairy plants is much more difficult. Breeding for high levels of resistance to fungal and viral pathogens should involve selection of buckwheat variants displaying the traits just specified. Figures 3; references 14: 13 Russian, 1 Western.

UDC 631.52:632

**Use of N.I. Vavilov's Law of Homologous Series in Studies on Plant Pathogens and Plant Breeding for Immunity**

18400241c Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 5, Sep-Oct 88 (manuscript received 20 Mar 87) pp 50-54

[Article by A. I. Chumakova, All-Union Scientific Research Institute of Phytopathology, Bolshiye Vyazemy, Moscow Oblast]

[Abstract] Personal research and the published literature indicate the general applicability of N. I. Vavilov's law of homologous series, which holds that a parallelism applies to phenotypic variability of closely related species, genera, and families. This makes it possible to determine which traits, virulence genes of the pathogen or resistance genes of the host prevail in a given population and what may be expected with some degree of certainty in related organisms, e.g., plants or fungi. Thus, monitoring natural or induced mutations in light of an expected spectrum of changes in one species provides an insight as to what may be expected in another. Using such criteria in phytopathology and mycology should provide information on the appearance of new races of pathogens and facilitate breeding for resistance. References 36: 22 Russian, 14 Western.

UDC 635.25:632.938

**Use of Biogenic Inducer of Protective Responsiveness in Onions to Mitigate Losses During Storage**

18400241d Moscow SELSKOKHOZYAYSTVENNAYA BIOLOGIYA in Russian No 5, Sep-Oct 88 (manuscript received 25 Aug 87) pp 57-59

[Article by A. P. Dmitriyev, Institute of Botany, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] Trials were conducted with a mycelial extract obtained from the fungus *Botrytis allii* to determine its properties as a biogenic inducer capable of protecting onions from disease and spoilage during storage. Using the Stringunovskiy variety of onions, widely cultivated in Ukraine, showed that spraying the onions 2 weeks before harvesting with low concentrations (0.01-0.03 percent) of the inducer improved resistance to fungal diseases and prevented sprouting and spoilage during storage. In part at least, the effects of the biogenic inducer were evidently due to enhanced synthesis of abscisic acid and of the plant hormones cibulin 1d and 2d. References 7 (Russian).

UDC 578.85:578.28

**Mannan Sulfates as Inducers of Plant Resistance Against Viral Infections**

18400367d Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 6, Nov-Dec 88 (manuscript received 10 Feb 87) pp 732-737

[Article by A. G. Kovalenko, T. D. Grabina, A. D. Bobyr, E. S. Korbelaynen, G. A. Vitovskaya and N. P. Yelinov, Institute of Microbiology and Virology, Ukrainian SSR Academy of Sciences, Kiev; Leningrad Institute of Pharmaceutical Chemistry]

[Abstract] Trials were conducted with extracellular linear mannan (LM) of *Rhodotorula rubra* in limiting tobacco mosaic virus infection in Immunnyy 580 tobacco and in thorn apple plants. The studies involved subepidermal injections of LM or its sulfated derivatives (MS-1.8 = 1.8 sulfate group/mannose monomer, or MS-0.5 = 0.5 sulfate groups/mannose monomer) 1-5 days prior to infection with TMV. Injection of MS-1.8 or MS-0.5 (1 mg/ml) was shown to limit the size and number of local lesions. The effects of LM were of more limited duration and diminished only the number of lesions. There were no differences between the effects observed with MS-1.8 and MS-0.5. Evidently, even a single sulfate group per two mannose monomers was sufficient to enhance the antiviral properties of LM. MS was also effective in reducing the size of lesions on the thorn apples, but was without effect on the number of lesions. Incubation of the infected plants at 32°C for 3 days completely abolished the antiviral effects of MS, which were also partially diminished by injection of actinomycin D (5-20 µg/ml). Neither factor, however, altered with effects seen with LM. Although the mechanism of action

of MS in this respect remains unclear, it appears probable that a number of biochemical and morphological steps are involved and that the initial stage involves binding to a receptor behaving as a lectin. Figures 2; references 14: 7 Russian, 9 Western.

UDC 577.115.3

**Active Factors Inducing Defensive Reactions in Potatoes**

18400379b Moscow PRIKLADNAYA BIOKHIMIYA I MIKROBIOLOGIYA in Russian Vol 24 No 6, Nov-Dec 88 (manuscript received 9 Feb 87) pp 789-794

[Article by L. I. Chalova, S. A. Avdyushko, K. A. Karavayeva, L. A. Yurganova and O. L. Ozeretskoy, Institute of Biochemistry imeni A. N. Bakh, USSR Academy of Sciences, Moscow]

[Abstract] Screening studies were conducted with various factors derived from the fungus *Phytophthora infestans* in order to identify the agents responsible for inducing defensive reactions in potatoes. The studies involved fractionation of the fungal lipoglycoprotein (LGP) complex recognized as an efficient inducer of phytoalexins. The results of the screening established that arachidonic acid and eicosapentaenoic acid, two polyunsaturated fatty acids found in polar and neutral lipids, were the primary active principles in the LCP complex. Both in terms of phytoalexin induction and tissue necrosis, these two C-20 acids exceeded the LGP complex in potency and, therefore, appear to be of major importance in potato resistance to *phytophthora* infection. Figures 3; references 17: 10 Russian, 7 Western.

UDC 615.277.3.015.4.07:681.31

**Microcomputer-Based ADP for Sedimentation Analysis**

18400299c Moscow

*KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 22 No 11, Nov 88 (manuscript received 23 Mar 87) pp 1381-1385*

[Article by Yu. Yu. Volodin, V. V. Bergolts, and D. Yu. Blokhin, All-Union Oncological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] The availability of programs for microcomputers suitable for analysis of sedimentation patterns led to the design for ADP of sedimentation patterns using, insofar as possible, Soviet components. The basic components utilized a UV detector with storage of the experimental data on magnetic tapes and display in the

form of graphics and tables. The entire complex utilizes a Soviet Elektronika D3-28 microcomputer with 32K memory, a 15IE-00-013 monitor, a thermal printer 15V VP80-002, an oscillograph, and a recorder. A 8300 Uvicord II (LKB, Sweden) UV detector was employed for peak detection, with the notation that Soviet UV detectors KhD and PUM-2 may also be used. The control program, written in BASIC D3-28 version 3a, utilized 6 machine-code subprograms. Application of the system to the analysis of sedimentation patterns obtained for nucleoids derived from P 388 leukemic cells after in vivo exposure to a cytostatic antitumor preparation showed that a complete analysis was obtainable in 15 min, whereas manual evaluation required 40-60 min. In addition, the results were preserved on magnetic tape for easy review. The complete text of the program employed for analysis of the sedimentation patterns is available from the authors. Figures 3; references 13: 9 Russian, 5 Western.



UDC 615.33.015.2:615.275].015.4.07:519.24

**Mathematical Modeling of Combined Effects of Antibiotic and Immunomodulating Agent**  
*18400230d Moscow ANTIBIOTIKI I  
KHIMIOTERAPIYA in Russian Vol 33 No 10, Oct 88  
(manuscript received 23 Jan 87) pp 767-771*

[Article by Ye. V. Churnosov, Yu. V. Yurkevich and P. V. Tsyplenkov, Military Medical Academy imeni S. M. Kirov, Leningrad]

[Abstract] Mathematical models were devised for evaluation of the combined effects of antibiotics and immunostimulants in the management of bacterial infections, with the model consisting of a system of six conventional differential equations covering the concentration of microbial pathogens, number of antibody-producing plasma cells, antibiotic concentrations, etc. The theoretical considerations led to the conclusion that a synergistic effect of the combination was to be obtained when the immunostimulant was administered at the optimum time—2-3 days after infection. Administration of the immunostimulant at that time, in combination with an antibiotic, diminishes infectivity of the host by 35-40 percent in comparison with the results obtained when only the antibiotic is used. Administration of the immunostimulant 3-4 days after infection, i.e., after the period of incubation, is without effect on the outcome of antibacterial chemotherapy. Application of the two-factor experiment to mice infected with tularemia and treated with doxycycline and salmosan provided experimental confirmation for the model. Maximum survival rates (better than 80 percent) were obtained with subcutaneous salmosan (5 mg/kg doxycycline for 5 days beginning 24 h after infection. Consequently, the theoretical approach developed here may be used for determining optimum combinations of antibiotic and immunostimulant for the management of infectious processes. Figures 4; references 8 (Russian).

UDC  
615.332:577.182.75].015.2:615.371].015.46:612.017.1

**Multifactorial Immunopharmacologic Analysis: Combined Effects of Rifampicin and Low MW Microbial Immunomodulating Agent on Primary Immune Response to Fraction 1 of Vaccine EV**  
*18400230c Moscow ANTIBIOTIKI I  
KHIMIOTERAPIYA in Russian Vol 33 No 10, Oct 88  
(manuscript received 20 Jul 87) pp 763-767*

[Article by A. V. Nikitin, L. P. Ivanitskaya, V. M. Fishman and L. Ye. Bodunkova, All-Union Scientific Research Institute of Antibiotics, Moscow]

[Abstract] A mathematical study was conducted on the combined effects of rifampicin and a low MW microbial immunomodulator on the primary antibody and cellular (delayed hypersensitivity) responses to immunization with fraction 1 of the EV plague vaccine. The studies

were performed with male CBA mice, with the experimental results fitting second-order polynomial models. Quasi single-factor relationships were developed for quantitative evaluation of the contribution of each factor into the overall immune response. On the basis of these relationships, nomograms were created for determining the optimum-dose and time-of-administration parameters for the modifying agents to attain maximum immunostimulation. The humoral response was found to be less affected by the antibiotic and the immunostimulant than the cellular immune response. In general, whatever the conditions of administration of the microbial immunomodulator (MI), the delayed hypersensitivity diminished with increasing doses of rifampicin. An increase in antibody titers always obtained with increasing concentrations of the antibiotic and MI when the latter was given prior to immunization. Figures 3; references 6: 5 Russian, 1 Western.

UDC 616.33-006.6-085.28

**Intraperitoneal Administration of Antineoplastic Agents and Tactivin in Comprehensive Treatment of Stomach Cancer**  
*18400296a Kiev VRACHEBNOYE DELO in Russian  
No 9, Sep 88 (manuscript received 21 Mar 88) pp 3-6*

[Article by I. B. Shchepotin, V. A. Chernyy, Yu. A. Grinevich, L. Ya. Kamenets, S. P. Osinskiy, I. F. Labunets, and G. D. Bendyug, Department of Peritoneal Oncology and Clinical Immunology Laboratory, Kiev Scientific Research Institute of X-Ray Radiology and Oncology]

[Abstract] Therapeutic trials were conducted with a combination of chemotherapy and immunotherapy in patients with gastric cancer in an attempt to improve the survival rate and mitigate the adverse effects of cytostatic agents on the immune system. The study involved 60 patients with radical or palliative resection. Combination chemotherapy was commenced 8-9 days after the surgery, with intraperitoneal administration of fluorouracil, for a total dose of 3-4 gm, and adriablastin, for a total dose of 90-100 mg. Immunotherapy with tactivin was commenced 3-4 days before the start of chemotherapy and extended for 3-4 days after chemotherapy ended; 1 ml of the preparation was administered subcutaneously every 3 days, for a total of 9-10 injections. Twenty-five of the patients were not treated with tactivin. Immunological monitoring showed that the antineoplastic agents had an adverse effect on cellular and humoral immunity and that the immune status was protected by the administration of tactivin. These observations demonstrated that for the management of gastric cancer, intraperitoneal chemotherapy, which was previously shown to be more efficacious than chemotherapy administered by other routes, mitigated the negative impact on the immune system when combined with

tactivin and maintained it at baseline levels. Furthermore, intraperitoneal administration of fluorouracil and adriablastin was seen to preclude toxic side effects on other organs and systems.

UDC 612.112.95.017.1.06:612.015.2

**Tufts Effects in In Vivo and In Vitro Induction of Suppressor Macrophages**

18400338c Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 11, Nov 88 (manuscript received 29 Nov 87) pp 559-561

[Article by D. A. Voyevodin, Cytostatic Preparations Section, 2nd Moscow Medical Institute imeni N. I. Pirogov, Moscow]

[Abstract] The recent implication that tufts may possess immuno-suppressive action led to a series of studies on CBA/CaLacSto and (C57BL/6 x BALB/C)<sub>F1</sub> (B6C) mice involving splenocyte incubation with tufts, to define this aspect of tufts activity. In one study, incubation of splenocytes with tufts in vitro, intravenous reinfusion into syngeneic animals, immunization with SRBC, and determination of antibody-forming cells in the spleen by Jerne's method showed a 75 percent reduction in the immune response. In another set of experiments, tufts was shown to exert an immunosuppressive effect when incubated with a combined mixture of glass-adhering and nonadhering splenocytes. Finally, intravenous administration of tufts (0.3 mg/kg) 1 h after infusion of syngeneic cells from donors immunized with human erythrocytes led to a 3-fold reduction in the number of splenic antibody-forming cells vs. control values. In conjunction with the published literature and the present experiments, the data suggest that tufts

displays immunosuppressive activity through induction of suppressor macrophages. References 5: 1 Russian, 4 Western.

UDC 57.087:612.112.94.017.1

**Cytometric Method of Determining Parameters of Interaction of Synthetic Immunostimulators and Lymphocyte Surface**

18400318a Leningrad TSITOLOGIYA in Russian

Vol 30 No 10, Oct 88 (manuscript received

15 Jul 87) pp 1218-1225

[Article by V. V. Shcherbukhin, D. V. Zasyukin, F. I. Ataulakhanov and B. G. Skuybin, Institute of Immunology, USSR Ministry of Health, Moscow]

[Abstract] The creation of artificial immunogens requires a study of the mechanisms of the immunostimulating influence of the polymer carriers. Various effects of polymers on immunocompetent cells have been discovered, the most important of which is the change in permeability of the cell membrane. This article presents a cytofluorometric method for determining the equilibrium constant of association of ligands with the cell surface, as well as the average number of binding sites on the surface of a single cell. The advantages of the method include its capability of studying the adsorption of a wider range of synthetic polymers than can be studied with electrophoresis and a higher degree of reliability (one cytofluorogram is based on up to  $10^6$  cells). Studies were performed on poly-L-lysine adsorption on chronic human myelomogenic leukemia cells (K-252). The cytofluorometric method was used to produce an adsorption isotherm in the form of curves that illustrate the relationship of intensity of fluorescence of cells and initial concentration of poly-L-lysine; the isotherm reflects the , reflecting the variation in the filling of adsorption sites with the polymer molecules. Figures 3, references 12: 9 Russian, 3 Western.

UDC 615.849.1:616.15(048)

**Effects of Low-Energy Lasers on Blood**

18400296b Kiev VRACHEBNOYE DELO in Russian  
No 9, Sep 88 (manuscript received 4 Nov 87) pp 67-70

[Article by N. F. Gamaleya and V. Ya. Stadnik, Department of Biological and Antineoplastic Effects of Lasers, Institute of Oncological Problems imeni R. Ye. Kavetskiy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] A summarizing survey of largely Soviet literature on research on the effects of low energy laser irradiation of the blood is presented. Both in vivo and in vitro trials, conducted largely with helium-neon lasers, have shown that, in most cases, laser irradiation has a stimulatory effect on the function of the blood cells and enhances hemopoiesis. Furthermore, both cellular and humoral immune responses have also been shown to be enhanced by laser action, leading to clinical assessment of lasers in a variety of conditions. To date, intravascular blood irradiation with helium-neon lasers using fiberoptic technology has been shown to be beneficial in ischemic heart disease, septic endocarditis, and atherosclerosis, and in oncology. More recent observations indicate that laser irradiation of the blood inhibits

thrombogenesis, which further expands the potential clinical applications to thromboembolic conditions. References 45: 44 Russian, 1 Western.

UDC 616.153.1-074:616.13/.14-002-085.849.19

**Ceruloplasmin as Therapeutic Indicator of Intravascular Laser Irradiation in Various Inflammatory Processes**

18400296c Kiev VRACHEBNOYE DELO in Russian  
No 9, Sep 88 (manuscript received 3 Feb 88) pp 71-72

[Article by Ye. P. Konovalov, Chair of General Surgery, Kiev Medical Institute]

[Abstract] Therapeutic trials were conducted with intravascular helium-neon laser (LG-75, 0.633 nm, 1.4-2 mW power output, 0.8 mW/cm<sup>2</sup> power flux density) irradiation of the blood in the case of 8 female patients with suppurative complications of pancreatitis. A course of treatment consisted of 6-8 daily 30-min sessions, with the clinical outcome correlated with plasma ceruloplasmin levels. The data showed that after the course of irradiation the ceruloplasmin levels increased by 1.1- to 3.8-fold, with an average increase of 2.4-fold. No patients survived if the ceruloplasmin EPR signal intensity was below 0.19. These observations suggest that ceruloplasmin may have prognostic utility in septic complications of pancreatitis. References 5 (Russian).

UDC 615.384:547.221].015.4:616.155.2/.3].076.9

**Leuko- and Thrombocytopenic Reactions of the Body Following Intravenous Administration of Perfluorocarbon Emulsion**

18400292a Moscow *GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian* No 11, Nov 88 (manuscript received 17 Apr 86) pp 45-48

[Article by L. A. Sedova, M. V. Berkos and N. N. Pyatovskaya, Leningrad Scientific Research Institute of Hematology and Blood Transfusion, RSFSR Ministry of Health]

[Abstract] Experimental trials were conducted with perfukol (perfucol), a Soviet blood substitute (perfluorodecalin:perfluorotripropylamine 7:3), to assess its effects on formed elements of the blood in several species. The test batch consisted of a perfukol emulsion prepared with 5 percent proxanol (ethylene oxide-propylene oxide copolymer) containing 30 percent by vol of the perfluorocarbon with a particle size of  $0.15 \pm 0.05 \mu$ . In the case of 16-22 kg rabbits with plethoric shock due to injection of 1 ml perfukol, the initial 5 min after the intravenous administration of perfukol was accompanied by marked leukopenia and thrombocytopenia. Within 20 min the leukocyte and thrombocyte counts showed recovery to essentially baseline levels. The drop in leukocytes in the initial 5 min consisted of almost complete disappearance of granulocytes. The decrease in lymphocytes was less pronounced, decreasing by 37 percent in the rats, 47 percent in the rabbits, and to 38 and 67 percent in the dogs with moderate and severe hemorrhage, respectively. An analogous leuko- and thrombocytopenic effect was obtained with the infusion of perfluoran in rabbits. These effects of perfluorocarbon infusion were attributed to activation of complement. However, the fact that clinical use of such compounds

does not always entail complications of this type underscores the complexity of the pathogenetic mechanisms responsible for this phenomenon. Figures 3; references 6: 2 Russian, 4 Western.

UDC 615.38:007.5

**Prospects of the Use of an Automated Management System in Blood Service Institutions**

18400292b Moscow *GEMATOLOGIYA I TRANSFUZIOLOGIYA in Russian* No 11, Nov 88 pp 55-57

[Article by T. N. Danilova, G. A. Kholodnyy and K. Yu. Litmanovich, doctor of medical sciences, Leningrad Scientific Research Institute of Hematology and Blood Transfusion RSFSR Ministry of Health]

[Abstract] A cursory discussion is provided of the advantages of implementing ASU technology at blood banks and transfusion centers, much as has been one in the West. Computerized record keeping and monitoring of donors, recipients, typing results, etc., is a significant step toward paper reduction and simplification, as well as toward greater efficiency in managing blood and blood products. Regional networks tying-in several transfusion centers has been found to be an effective means of resource sharing the United States and can, and must be, reproduced in the USSR. The Leningrad Scientific Research Institute of Hematology and Blood Transfusion has taken the lead in the USSR in establishing a computerized network for blood services in the Leningrad region. Only through reliance on computers will it be possible to manage the ever-increasing volume of information that must be processed to ensure quality blood services in the future. References 13: 6 Russian, 4 Western.



UDC 617.53-001.45

**Therapeutic and Diagnostic Measures for Gunshot Wounds of the Neck**

18400298 Tashkent MEDITSINSKIY ZHURNAL  
UZBEKISTANA in Russian No 10, Oct 88 (manuscript  
received 5 Jan 88) pp 19-22

[Article by V. S. Popov and A. I. Verkhovskiy, Tashkent]

[Abstract] Experience gained in treating 37 men with bullet and fragment wounds of the neck was reported. Gunshot wounds of the neck are extremely serious injuries

and require a team of specialists in their treatment: neurosurgeons, angiosurgeons, anesthesiologists and otolaryngologists. The diagnosis, must establish the extent of the damage, so that a unified plan of treatment can be decided upon among the specialists. The principal task is to eliminate possible vascular damage followed by damage to the spinal cord. Tracheal and esophageal damage should be confirmed by esophago-and laryngotracheoscopy. Diagnostic procedures are very often carried out concurrently with resuscitation measures aimed at protecting respiratory functions. Proper sequence of surgical procedure is very important. In damage to the spine and spinal chord, early treatment of injury to the vertebral canal, sealing of the dural sac, and localized posisurgical hypothermia over 3-5 days are required. References 7: 3 Russian, 4 Western.

UDC 537.868:612.438.017.1

**Effects of Microwaves on Expression of Certain Surface Markers by Thymocytes**

18400284b Leningrad TSITOLOGIYA in Russian  
Vol 30 No 11, Nov 88 (manuscript received 11 Nov 86;  
in final form 23 Dec 87) pp 1345-1349

[Article by V. M. Yevstropov and O. N. Melikhova, Kirghiz Scientific Research Institute of Health Resort Science and Physiotherapy, Frunze]

[Abstract] The fact that microwaves may affect expression of surface markers on lymphocytes led to in vitro experiments designed to compare the effects of decimeter (460 MHz, 80 or 320 mW/cm<sup>2</sup>) and centimeter (2375 MHz, 320 mW/cm<sup>2</sup>) electromagnetic waves on guinea pig and mouse thymocytes. The thymocytes were irradiated for 10 min immediately after removal and homogenization, and were subjected to conventional testing techniques. Using rabbit anti-T sera led to the demonstration that 80 mW/cm<sup>2</sup> decimeter waves enhanced expression of the Thy-1 antigen on the mouse thymocytes. Higher-intensity decimeter waves were less effective, as were the centimeter waves. Confirmatory data for the efficacy of the 80 mW/cm<sup>2</sup> intensity decimeter waves was also obtained with guinea pig thymocytes, which induced the appearance of receptors for syngeneic erythrocytes on the more immature T cell. High-intensity decimeter waves enhanced the appearance of receptors for syngeneic erythrocytes on mature thymocytes, but depressed their expression on the immature thymocytes. It appears that basically similar effects of the 80 mW/cm<sup>2</sup> on the expression of surface markers in different species may involve similar electrophysiological mechanisms, depending on the stage of cell maturation. References 24: 5 Russian, 19 Western.

**Effects of Decimeter Band Electromagnetic Waves on Immune Indicators and Plasma Proteins of Athletes and Their Dynamics**

18400284a Moscow TEORIYA I PRAKTIKA  
FIZICHESKOY KULTURY in Russian  
No 12, Dec 88 pp 45-46

[Article by G. R. Giginayshvili, I. V. Plakhov, V. V. Nikolayeva, L. I. Novikova and A. Yu. Belousov, All-Union Scientific Center for Medical Rehabilitation and Physical Therapy, USSR Ministry of Health, Moscow]

[Abstract] The demonstration that highly trained athletes often display evidence of immunodeficiency, plus the fact that such changes may be correctable by treatment with decimeter band electromagnetic waves, led to studies on the effects of irradiation of the clavicular and hip regions with electromagnetic waves on the status of humoral and cellular immunity in 54 highly qualified oarsmen. Comparison with data derived from 12 healthy nonathletic men serving as controls showed that in the athletes T lymphocytes were depressed to 38.2 ± 1% (p < 0.01). This was largely due to depression of the T

helper cells (19.7 ± 4.8 %; p < 0.01), while the T suppressor cells remained largely unaffected. In addition, B lymphocytes were elevated to a statistically significant extent (to 29.8 ± 4.2%; p < 0.01). Plasma levels of acute phase proteins (α<sub>1</sub>-antitrypsin, haptoglobin, orosomucoid) were also depressed. After a course of treatment consisting of irradiation of the clavicular region with decimeter band electromagnetic waves the total concentration of T lymphocytes rose from 39.6 ± 6.3 to 53.6 ± 7.5 % (p < 0.01), including an increase of T helper lymphocytes from 21.8 ± 7.5 to 38.5 ± 6.4% (p < 0.05). T suppressor cells remained unaffected, while B lymphocytes fell from 26.1 ± 5.2 to 19.3 ± 5.2% (p < 0.01). Irradiation of the hip region flexor muscles was ineffective. In addition, irradiation of the clavicular area also abolished the immunosuppressive effects of strenuous physical exertion while, again, irradiation of the hip region was without effect. The efficacy of the decimeter band waves when applied to the clavicular region was attributed to a stimulatory effect on the cervical sympathetic ganglia and the vagal nerve, components of the nervous system that directly influence the physiological status of the pituitary, the thyroid gland, and the cardiovascular system and facilitate adaptive mechanisms. References 11: 6 Russian, 5 Western.

UDC 615.849.112.015.4:612.017.1].076.9

**Immunobiological Effects of Athermal-Intensity Decimeter-Band Microwaves**

18400284c Moscow VOPROSY KURORTOLOGII,  
FIZIOTERAPII I LECHEBNOY FIZICHESKOY  
KULTURY in Russian No 6, Nov-Dec 88 (manuscript  
received 5 Jun 88) pp 8-10

[Article by S. B. Pershin, I. D. Frenkel, A. I. Galenchik, Ye. V. Gontar and A. S. Bobkova, USSR Ministry of Health]

[Abstract] An analysis was conducted on the immune response and hormonal balance in 2.5-3.0 kg male rabbits subjected to athermal decimeter-band microwaves. The animals were irradiated in the thyroid, adrenal, and transcerebral projections (6 min/day for 10 days), and immunized with SRBCs 10 days after the last irradiation. The most profound effect on the immune system was obtained with transcerebral irradiation. Endocrine monitoring demonstrated stimulation of the hypothalamus-pituitary-adrenal axis consisting of increased glucocorticoid secretion by the adrenals and depression of plasma levels of thyroid hormones. Concomitantly, humoral immune response to the SRBCs was depressed in comparison with control data. Irradiation of the thyroid region, on the other hand, was accompanied by activation of thyroid function and inhibition of glucocorticoid secretion by the adrenal glands, resulting in an enhanced humoral immune response. Finally, animals in which the adrenal region was irradiated showed no evidence of modulation of either the endocrine or of the immune system. These findings also demonstrated that

the CNS, the hypothalamus, and the thyroid gland are much more susceptible to the action of athermal-intensity

microwaves than are the adrenal glands. References 3: 1 Russian, 2 Western.

UDC 615.33.033.1.07

**Biokinetics of Magnetic Drug Carriers for Targeted Drug Delivery**

18400230a Moscow ANTIBIOTIKI I

*KHIMIOTERAPIYA in Russian Vol 33 No 10, Oct 88  
(manuscript received 21 Jul 87) pp 744-751*

[Article by M. I. Papisov, V. Yu. Savelyev, V. B. Sergiyenko and V. P. Torchilin, Scientific Research Institute of Experimental Cardiology, All-Union Cardiological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] Pharmacokinetic studies were conducted on magnetic drug carriers employed for targeted drug delivery to assess problems related to clearance and the effects of the nature of the carrier on tissue and organ distribution. Using conventional pharmacokinetic approaches, the data demonstrated that first-order kinetics applied to a variety of  $^{99m}\text{Tc}$ -labeled magnetic preparations on intravenous administration to 3.5 kg chinchilla rabbits. Both the size of the particles and the nature of their surface determined the half-life in the circulator system, as did the drug carrier was eliminated at rates differing by as much as 1.5-fold among the individual animals. In summary, the half-life of 1-5  $\mu\text{m}$  particles was 5 min or less, with accumulation limited almost exclusively to the liver. Furthermore, polysaccharide-coated particles were deposited in the liver at a rate that was 1.5- to 2-fold slower than of albumin-coated particles. The half-life of 10-30  $\mu\text{m}$  particles was on the order to 5-10 min, with the shorter half-lives applicable to the albumin-coated particles which were deposited largely in the liver and, diffusely, in the lungs and other tissues. The half-lives for the polysaccharide-coated particles were 1.2- to 1.5-fold greater, with 80 percent of the particles captured in the liver, 10 percent in the skeleton, and 2-3 percent in the spleen. The findings demonstrated the feasibility of one-animal comparative assays for half-life determinations by using a sequence of injections consisting of standard preparation—test preparation—standard preparation. Figures 4; references 15: 3 Russian, 12 Western.

UDC 615.33.033.1

**Prediction of Biological Effect of Magnetic Drug Delivery Systems**

18400230b Moscow ANTIBIOTIKI I

*KHIMIOTERAPIYA in Russian Vol 33 No 10, Oct 88  
(manuscript received 21 Jul 87) pp 751-757*

[Article by M. I. Papisov and V. P. Torchilin, Scientific Research Institute of Experimental Cardiology, All-Union Cardiological Scientific Center, USSR Academy of Medical Sciences, Moscow]

[Abstract] Mathematical foundations were laid for assessing pharmacodynamic sequelae of magnetic drug delivery systems, based on conventional kinetics applicable to drugs. The mathematical models were devised for mass transfer phenomena in the blood stream, with the target organs treated as components of the circulatory system. The major

factors underlying efficient drug delivery and, thus, therapeutic efficacy were identified as rapid delivery to the targets site, release from the vehicle, and attainment of requisite concentrations at the target site. Problems to be considered are the fact that the liver may be subjected to unusual doses of the magnetic particles and the drug because hepatic blood flow constitutes a significant part of systematic circulation. There is also the risk that the magnetic particles may reach high concentrations in the venules where the blood flow is slower, rather than in the capillary network of the target organ, in effect bypassing the target organ. In addition, the size of the magnetic delivery vehicles and their concentration has to be controlled in order to avoid overload of the RES and attendant complications. Figures 7; references 7: 2 Russian, 5 Western.

UDC 615.214.31:547.583.5].012.1

**Synthesis and 'Nootropic' Activities of N-R-Oxamoylamino Acids**

18400299a Moscow

*KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 22 No 11, Nov 88 (manuscript received 14 Aug 87) pp 1329-1332*

[Article by G. P. Petyunin, A. S. Zaks, V. N. Petyunina, Zh. V. Dmitriyevskaya, and T. A. Kapitonenko, Ukrainian Institute for Postgraduate Medicine; Kharkov; Kharkov Medical Institute]

[Abstract] Eleven N-R-oxamoylamino acids were synthesized by the reaction of oxamic esters with the appropriate amino acids in the presence of an equivalent concentration of KOH, with the reactions carried out at room temperature in the universal organic solvent N,N'-dimethylformamide. Four of the resultant products—benzyloxamyl- $\gamma$ -aminobutyric acid (I), decyloxamyl- $\gamma$ -aminobutyric acid (II), l-adamantylloxamyl- $\gamma$ -aminobutyric acid (III), and 4-methyl-1,3-phenylene-oxamyl- $\gamma$ -aminobutyric acid (IV)—were tested for nootropic effects on rats, in terms of effect on memory and ability to reduce oxygen demand in the brain. Conditioned avoidance responses demonstrated that III, when administered intraperitoneally in a dose of 300 mg/kg, diminished the onset of amnesia to 50% of the test animals, whereas 72% of the untreated control rats developed amnesia. Preparations I and IV actually increased the incidence of amnesia to 100% of the tested rats, while II and the conventional agent aminalol [sic] were without telling effects. Antihypoxic effects were assessed in pressure chamber studies with the pressure dropped to the so-called 'lethal plateau' of 198 mmHg for 3 min. Each of the four agents in question and aminalol, when administered intraperitoneally 1.5 h before the test, in doses of 300-500 mg/kg, extended the mean duration of survival from a control value of 48 plus or minus 4 sec to 50-98 sec. However, while the control and aminalol survival rates were 0%, those with I, II, III, and IV ranged from 17 to 75%. The highest survival rate (75%) was obtained with compound III (300 mg/kg), which was also the most effective agent in the memory test. These preliminary findings suggest that further screening



should be conducted among the oxamoyl derivatives of  $\gamma$ -aminobutyric acid for nootropic agents. References 8 (Russian).

UDC 615.849.1.015.25:547.568].012.1

**Synthesis and Radioprotective Activities of 2-Phenylethylamine Derivatives**

18400299b Moscow

*KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian Vol 22 No 11, Nov 88 (manuscript received 14 Aug 87) pp 1349-1355*

[Article by T. V. Alpatova, V. Yu. Kovtun, Z. A. Olovyanishnikova, A. D. Klimova, V. N. Kulinskiy, and V. G. Yashunskiy, Institute of Biophysics, USSR Ministry of Health, Moscow; Krasnoyarsk Medical Institute]

[Abstract] Trials were conducted with a series of 2-phenylethylamine derivatives to obtain better understanding of factors responsible for radioprotection. The study proceeded from the demonstration that the protective effects of 1-(*m*-hydroxyphenyl)-2-aminoethanol (I) and its derivatives depends on substituents on the nitrogen atom. For example, the *N*-methyl (II) and the *N*-ethyl (III) congeners of I have also been shown to be radioprotective. Accordingly, female CBA x C<sub>57</sub>Bl/F<sub>1</sub> were treated with the agents in question and with  $\beta$ -carbon substituted compounds 15 min before 7.5 Gy x-irradiation and the 30-day survival rates determined (control = 5%). With I, II, and III (administered i.p. or s.c.), the respective survival figures were 83 plus or minus 6, 88 plus or minus 4, and 80 plus or minus 13%. Replacement of the hydroxyl group on the  $\beta$ -carbon led to an increase in toxicity and diminished radioprotection. Replacement of the hydrogen atom with a methyl, benzoyl, or an acetyl group also diminished radioprotection. A chloro-derivative showed marked radioprotection (60 plus or minus 16%), while carbonyl analogs were relatively weak (about 30%). Increased radioprotection could be secured with the latter compounds by increasing several-fold the dosage employed with I, II, and III (about 5-10 mg/kg). A significant radioprotective effect was also obtained with one spirocyclohexanoxazolidine analog (70+%). On balance, these observations were interpreted to indicate that radioprotection was based not only on the chemical nature of the substituent, but also on its steric influence on the  $\beta$ -carbon atom. References 14: 5 Russian, 9 Western.

UDC 612.821.6+612.822.3+615.78

**Age Factors in Effects of Antioxidant of the 3-Oxypyridine Group on CNS Function in Mice**

18400358d Moscow *ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 38 No 6, Nov-Dec 88 (manuscript received 7 May 87) pp 1126-1131*

[Article by T. A. Voronina and O. A. Kutepova, Institute of Pharmacology, USSR Academy of Medical Sciences, Moscow]

[Abstract] An evaluation was conducted on the behavioral effects of 2-ethyl-6-methyl-3-oxypyridine (EMOP) in relation to age on outbred male mice. The animals were divided

into a young group (3 months old, 18-20 gm) and an old (15 months, 30-35 gm) group and injected once with 50 mg/kg EMOP or given a 0.025 percent EMOP solution to drink under conditions of water deprivation for 21 days to give a daily intake of 30-75 mg/kg. The mice were observed for behavioral patterns and tested in passive avoidance tests to assess the effect of EMOP. Control observations showed that the older mice and the younger mice differed in general emotional status, with the older mice characterized by passivity to handling and relaxed muscle tone, while the younger mice actively avoided handling. A single administration of EMOP reduced emotional reactivity in both the young and old mice. However, its effects in inhibiting exploratory behavior and retention of conditioned avoidance reflexes were more pronounced in the older mice. Long-term (21 days) intake of EMOP enhanced emotional reactivity in the young mice and depressed it in the older group, but was without effect in either group on exploratory behavior. On balance, these findings suggest that EMOP, an agent that limits lipid peroxidation, was beneficial in restoring certain CNS functions to a more normal level, particularly in retention of learned avoidance reflexes. Figures 2; references 23: 19 Russian, 4 Western.

UDC 612.615+612.821.2

**Effects of Substance P (SP) on Reproduction of Memory Engrams and on Amino Acid Levels in Brain Formations of Rats With Experimental Neurosis**

18400358e Moscow *ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian Vol 38 No 6, Nov-Dec 88 (manuscript received 4 May 87) pp 1152-1157*

[Article by P. A. Nerush, Chair of Pharmacology, Medical Institute, Dnepropetrovsk]

[Abstract] An assessment was conducted on the possible role of SP in memory engrams and the free amino acid pool in various brain structures under conditions of experimental neurosis. The studies were performed on female Wistar rats using a conditioned passive avoidance reflex to test the memory effects of SP in cases complicated by onset of conflict neurosis. The data showed that the onset of a neurotic state was accompanied by amnesia in 64 percent of the experimental animals. Concomitant determinations of free amino acid levels in a number of brain structures revealed a number of changes. In particular, both GABA and glycine were elevated in the frontal cortex, and GABA and glutamate in the hippocampus and the corpus striatum. Intraperitoneal administration of SP (125  $\mu$ g/kg) led to the recovery of the conditioned reflex in 80 percent of the animals. SP administration also led to a significant decrease in the levels of GABA in the frontal cortex, hippocampus, and the corpus striatum and to an increase in the midbrain. These findings demonstrated that deterioration of memory functions in a neurotic state found correlation in altered levels of amino acids in various brain structures. The effects of SP in restoring memory functions were accompanied by changes in the free amino acid pool, particularly those with established neurotransmitter significance. Consequently, SP appeared to act by modulating GABA-ergic and glutamatergic mechanisms. References 25: 14 Russian, 11 Western.

UDC 615.851.111:656.61

**Physiological Mechanisms of Autogenic Training and Its Use by Seamen on Long Voyage**

18400341 Moscow VOYENNO-MEDITSINSKIY  
ZHURNAL in Russian No 7, Jul 88 pp 57-58

[Article by I. A. Porogelov, Lieutenant Colonel, Medical Service, and Ye. G. Shimanovich, Captain, Medical Service: "Physiological Mechanisms of Autogenic Training and Its Use by Seamen on Long Voyage"]

[Text] The effect of unfavorable factors of habitation may lead to the development, in seamen on long voyages, of neuroasthenic states characterized by fatigue, apathy, headache, poor sleep, bad mood, irritability, difficulty in concentration, and a reduced capacity to work. (Sapov, I. A., Solodkov, A. S., 1980).

Autogenic training, in addition to other methods, is used to treat these disturbances. Its physiological mechanisms are very complex and have not yet been studied completely. Foreign authors frequently explain these mechanisms from positions of psychosomatic and other concepts that are only very remotely connected with physiology. We tried to clarify the mechanisms of autotraining, described by V. S. Lobzin and M. M. Reshetnikov (1986). In our opinion, proceeding from the teachings of A. R. Luriya (1973), it is possible to assume the participation of all three blocs of the brain in autogenic training. The first is the regulation of tonus and alertness; the second is the reception, processing, and storage of information; and the third is the programming, regulation, and control of complex forms of activity.

The frontal lobes (the third bloc) is where the setting of goals, regulation of one's own behavior according to the goals and collation of the effect with the initial intentions take place. At the time of autotraining, there is formed, in the third sections of the frontal lobes, a focus of concentrated excitation, according to I. P. Pavlov. Later, the impulses flow into the second and first zones of the frontal lobes, through the extrapyramidal system into the reticular formation (first bloc). The inhibitory effect on muscle tonus through the so-called gamma loop is intensified. The cerebral cortex tonus also is reduced by feedback. The center of excitation in the frontal lobes is surrounded by a zone of negative induction. In this case, the analyzer activity of the cortex is decreased abruptly; this is expressed in the form of a reduction in criticism (Platonov, K. I., 1957). Conditions that facilitate autosuggestion are created.

Conditioned-reflex mechanisms of autogenic training are realized through the posterior associative center (second bloc). Gradually, a conditioned reflex is elaborated and reinforced in the one undergoing training. As a

result, after the first words of autotraining and sometimes only after assuming an appropriate pose, all muscles of the body of this person are relaxed, internal calm occurs, etc.

Thus, all three blocs of the brain participate in autotraining. Training of these blocs occurs, the forces of the cortical processes of excitation and inhibition and their mobility, which increases the possibilities of self-regulation of the higher nervous activity and involuntary autonomic functions, exercise the will, attention, and imagination and "discipline" the emotions (Panov A. G. et al., 1980).

We used the method of autogenic training developed by V. Ye. Rozhnov and A. A. Repin (1977) in our modification to stop neuroasthenic disturbances in seamen on a long voyage.

V. Ye. Rozhnov and A. A. Repin assume that an optimal result is achieved by the constant use of a combination of heterosuggestive and autosuggestive components, i. e., suggestion and autosuggestion in one session, while carrying out all exercises (Repin A. A., 1979). They carried out autogenic training with a group of seamen assigned to the mess room on ships of the fishing fleet. In our studies, the exercise procedure was broadcast throughout the ship three times a day when the seamen on the regular watch lay down to sleep in their cabins. A long-playing tape recording played "Psychological Gymnastics" with a physician reading against the background of pacifying music. The necessary information was given to the subjects earlier in talks by the physician.

The advantage of this modification of autogenic training lies in the fact that it may reach practically the entire ship's crew. In addition to this, the session usually ended with the listeners falling into a deep sleep. The tape recording provides the subjects a teaching aid for independent mastery of the exercises. However, as practice showed, the seamen are trained willingly by listening to the recording but much more rarely by independent training.

Ship's specialists working as operators (52) and ranging in age from 20-28 years were kept under dynamic observation. They all performed a series of measures to maintain the capacity to work on the voyage (physical exercises, vitamin supplements, ultraviolet irradiation, conditioning). Those engaged in autotraining (30) made up the basic group, and 22 were in the control group.

On the 45th day of the voyage, the subjects completed a questionnaire containing 30 complaints of a neuroasthenic nature. Then, they completed a course (10 sessions daily) of autogenic training. On the 60th day, the subjects repeated the same questionnaire.

Results of the psychotherapeutic effect were evaluated by a 3-point system (1 point, sense of well-being unchanged; 2 points, significantly improved; 3 points,

persistent improvement of sense of well-being occurred with no sign of neurotic symptoms). In the basic group, 3 persons (10 percent) received a 1-point rating, 16 (52.8 percent) received 2 points, and 11 persons (37.2 percent) received 3 points. The sense of well-being among seamen in the control group was practically unchanged.

We assume that this modification of autogenic training is most suitable to conditions met on a long voyage and may be used in the prevention and treatment of neuroasthenic disturbances in seamen.

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UDC 612.121.2:796.21

#### Effect of Underwater Swimming for Distance While Holding One's Breath on Acid-Base Balance of Blood

18400342a Moscow VOYENNO-MEDITSINSKIY ZHURNAL in Russian No 8, Aug 88 pp 53-54

[Article by Col. M. I. Chernets, candidate of pedagogic sciences, and A. V. Potapov]

[Text] In recent years there has been extensive discussion in the literature of the question of the state of various physiological systems of the human body during adaptation to a physical load (F. Z. Meyerson, 1981; V. V.

Lopukhov, 1982; N. A. Agadzhanian, 1983; N. A. Fomin, V. P. Filin, 1986). Researchers are devoting increasing attention to the features of functional and metabolic changes that arise in the body during muscular activity with voluntary apnea (V. V. Mikhaylov, 1983; P. Astrand, 1960; C. Olsen et al., 1962; P. Scholander et al., 1962). However, there are still not enough accumulated data on this score to comprehend the general patterns of development of adaptive responses of the body to the contrasting effects of hypoxia and hypercapnia. This problem requires further development. Experimental research aimed at determining the biochemical mechanisms that constitute the basis of physiological responses could be quite helpful in solving it.

It is particularly important to study the effect of physical work performed when one's breath is held on the acid-base balance of the blood (ABB)—one of the most important endogenous physicochemical parameters—which belongs to the strict constants of the body and is a component part of homeostasis that provides for the normal functioning of the physiological systems of the human body (P. D. Gorizontov, 1981). The extent of change in blood ABB components is determined by the following principal factors: direction of effect of physical exercise, activation of aerobic and anaerobic elements of energy production, and the physical capacities of the individual under specific working conditions.

Our purpose here was to investigate the effect of free-form underwater swimming for distance on blood ABB. There are virtually no data in the literature concerning biochemical changes in athletes during competitions. Yet this is quite essential to the assessment of their special training and to the determination of the maximum functional capacities of the body. It should be noted that physical work performed while holding one's breath both on land and underwater is not out of the ordinary in military job operations or during combat operations.

A total of 106 athletes (men) aged 19-23 and having ratings I and II in military swimming (underwater swimming for distance) participated in the tests. Blood was drawn from a finger before and immediately after swimming underwater for a distance of 40-50 m. The time required for the athletes to cover those distances underwater varied in the range of 38-58 seconds. ABB parameters were assayed with the Astrup micromethod (P. Astrup, 1956) on the ABL-2 instrument and the OSM-2 Hemoximeter, both manufactured by Radiometer of Denmark.

The method we chose permits simultaneous determination of many parameters characterizing the acid-base equilibrium in the body: true pH and true carbon dioxide tension ( $pCO_2$ ), standard bicarbonate (SB) concentration, base excess (BE), and hemoglobin (Hb). ABB parameters before the underwater swimming were in the physiological range and did not differ from those cited in the literature (V. M. Kalinin et al., 1980; L. L. Shik, N. N. Kanayev, 1980). Long-distance underwater swimming elicited major changes in blood ABB parameters (see Table).



Blood acid-base parameters of underwater swimmers after going the distance, sample mean  $\bar{x} \pm m$

Parameter	Changes in parameters after underwater swimming			
	Normal	Moderate	Marked	Severe
pH, units	7.33 $\pm$ 0.02 (n=4)	7.31 $\pm$ 0.00 (n=34)	7.26 $\pm$ 0.01 (n=64)	7.16 $\pm$ 0.01 (n=4)
BE, mmol/l	—	4.00 $\pm$ 0.14 (n=6)	6.90 $\pm$ 0.08 (n=21)	10.60 $\pm$ 0.20 (n=79)
SB, mmol/l	22.60 $\pm$ 0.86 (n=5)	18.30 $\pm$ 0.07 (n=36)	16.90 $\pm$ 0.05 (n=27)	15.30 $\pm$ 0.09 (n=33)
pCO <sub>2</sub> , kPa	5.20 $\pm$ 0.02 (n=83)	4.35 $\pm$ 0.03 (n=19)	3.20 $\pm$ 0.14 (n=4)	—

Note: n—number of subjects.

In the vast majority of subjects, a decline of pH from 7.40 to 7.12 was observed after the underwater swim; it was within the range of the physiological norm in only 4 athletes. After the swim, BE changed from -3 to -15.8 mmol/l. Standard bicarbonate dropped from 20.2 to 12.2 mmol/l. SB was in the normal range in five athletes. Blood pCO<sub>2</sub> was in the normal range (4.07-6.0 kPa) after the swim in 83 subjects; it was low in 23 (as far down as 3.07 kPa). Hemoglobin was normal (2.17-2.56 mmol/l) in 48 underwater swimmers, high (up to 3.52 mmol/l) in 44, and low (as far down as 1.39 mmol/l) in 14.

These findings indicate that long-distance underwater swimming during competitions is associated with rather significant changes in acid-base balance. According to the literature, intensive underwater activity with voluntary apnea elicits a substantial accumulation of lactate in blood, which is indicative of triggering of anaerobic mechanisms for supply of energy to working muscles (C. Olsen et al., 1962; P. Scholander et al., 1962). The decline in blood SB levels is an inevitable consequence of neutralization of incompletely oxidized metabolites of anaerobic metabolism. There was also a deficiency of bases (BE became negative) and pH dropped.

After underwater swimming, i.e., after work in the range of submaximum capacity, when the anaerobic (glycolytic) route of ATP resynthesis prevails in supplying energy, there were dramatic changes in SB, BE and pH. Base deficiency reached -15.8 mmol/l, while pH reached 7.12, which is typical of decompensated metabolic acidosis (pH < 7.20). Apparently, the buffer systems were not able to assure strict stability of ABB during intensive underwater muscular work in a state of voluntary apnea.

According to current conceptions, the capability of buffer systems increases when adaptation to muscular work is improved as a result of training. Thus, in poorly trained athletes, there is a more significant decline of pH during moderate exercise than in trained athletes (E. Doll et al., 1966; C. Clausnitzer et al., 1969). At the same time, after

work sessions that grow to the limits of maximum capacity, dependence of pH shift on conditioning is not necessarily demonstrated (E. Doll et al., 1968).

Intensified neutralization of incompletely oxidized products during underwater work associated with acute hypoxia and hypercapnia is an additional source of CO<sub>2</sub> production. However, its removal in the first 60-75 seconds (the time required to draw blood) after underwater swimming apparently does not hinder respiratory function. Probably, the involuntary hyperventilation that occurs in athletes immediately after covering the distance is also involved in this. In the vast majority of swimmers, it did not change appreciably. The rise in hemoglobin to 3.52 mmol/l in 44 athletes is, in our opinion, attributable to the blood's adaptive response to the combined effect of hypoxia and hypercapnia.

On the basis of our results, it can be concluded that intensive physical exercise in the presence of the combination of hypoxia and hypercapnia (long-distance underwater swimming) leads to marked changes in blood ABB that are typical of subcompensated and decompensated metabolic acidosis. In spite of this, the vast majority of subjects failed to present external signs of fatigue or health-related complaints. No doubt, this is indicative of adequate physical stress caused by underwater swimming and of the functional state and reserve capacities of bodies of the athletes. However, the significant biochemical changes occurring in underwater swimmers during competitions are indicative of a need for thorough screening of prospective athletes, for training, and for adopting appropriate rest periods after underwater swimming.

These findings may be used in planning preventive measures to preserve work efficiency of servicemen working under analogous conditions and in preventing accidents.

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UDC 612.821

**Individual Variability of Vestibular Sensitivity From Subjective Sensations and Long-latent Vestibular Evoked Potentials**

18400100a Moscow *FIZIOLOGIYA CHELOVEKA in Russian Vol 14 No 4, Jul-Aug 88 (manuscript received 7 Jul 86) pp 562-568*

[Article by K. F. Trinus, Kiev Scientific Research Institute of Labor Hygiene and Occupational Diseases]

[Abstract] A formal analysis of individual characteristics of subjective thresholds of sensitivity and latent periods of peaks of long-latent vestibular evoked potentials recorded under the effect of threshold accelerations involved 18 healthy subjects. Subjective thresholds of sensitivity and vestibular evoked potentials were recorded by a method devised by the researcher. Only linear vertical accelerations were used; the mean value ranged from 0 to 20 cm/s<sup>2</sup>. An increase of amplitude of vestibular stimulus of threshold levels produced different sensations and different thresholds of sensitivity typical of cortical projection of the analyser. There was a progressive increase of ranges of acceleration with registration of corresponding sensations and vestibular evoked potentials. Increase of acceleration decreased the ability to individualize coefficients of variation of the latent period of peaks of subjective thresholds of sensitivity. The subjects included persons with low, intermediate and high variability of the latent period of vestibular evoked potentials with persons in the intermediate group being most numerous. A count of subjective sensations when vestibular evoked potentials were recorded showed that absolute values of latent periods are

higher in persons with higher variability of latent periods of peaks of vestibular evoked potentials. Some subjects displayed small absolute values of latent periods; greater variability of peak N<sub>1</sub>, which is usually most stable, was noted in these subjects. References 21: 9 Russian, 12 Western.

UDC 612.21+577.49:613.693

**Biorhythmological Features of Dynamics of External Respiration Indicators of Man During Performance of Passive Orthostatic Test**

18400100b Moscow *FIZIOLOGIYA CHELOVEKA in Russian Vol 14 No 4, Jul-Aug 88 (manuscript received 15 Dec 86) pp 577-585*

[Article by V. A. Galichiy, Moscow]

[Abstract] Healthy males (5) ranging in age from 26-40 years underwent a 20-minute orthostatic test in the morning, after fasting. Minute volume of respiration, minute volume of absorbed oxygen and exhaled carbon dioxide, the respiratory coefficient, partial pressure of oxygen and carbon dioxide in the alveolar gas mixture and oxygen consumption were used to assess the external respiration function. Subjects remained in a horizontal position on an orthostatic table for 12-13 minutes before the test. Initial data were recorded for 10 minutes and then the subjects were placed (within 3 seconds) in a position with head up and the trunk at an angle of 70 degrees to the horizontal. The external respiration indicators were recorded with subjects in this position for the entire 20-minute period of orthostatic effect. During this passive orthostatic effect, the dynamics of the indicators fluctuated within a range of nearly one minute. Disturbances of coordination of individual components of the pulmonary ventilation system appeared between the 4th and 7th minutes of orthostatic effect. This was attributed to stress in the subjects and is an indication of difficulties in adaptation of the body to the orthostatic effect. It was recommended that special attention be given to the depth and duration of the negative phase of the minute volume of absorbed oxygen and oxygen consumption during study of the cardiorespiratory system during the passive orthostatic effect, since it is likely that the degree of their expression may indirectly characterize the effectiveness of compensation of shifts of hemodynamics caused by the transition from a horizontal to a vertical position. Figures 4; references 14: 7 Russian, 7 Western.

UDC 612.017+612.135

**Increase of Adrenoreactivity of Microvessels and T-lymphocytes in Seamen on Long Voyages**

18400100c Moscow *FIZIOLOGIYA CHELOVEKA in Russian Vol 14 No 4, Jul-Aug 88 (manuscript received 9 Dec 86) pp 686-692*

[Article by S. V. Okhotnikov and A. A. Povazhenko]

[Abstract] Researchers studied the feasibility of using assessment of the microcirculation system to analyze the

adaptation mechanisms in seamen during a voyage. Sixty-seven seamen who ranged in age from 20 to 38 and who sailed in low and temperate latitudes were examined. The control group included 30 seamen of the same age who had not been to sea for 6 months or more. Assessments were based on biomicroscopy of conjunctiva vessels and capillaroscopy of the finger and toe nail bed. Adrenal activity of the microvessels and subpopulations of the T-lymphocytes was found to increase in the seamen during adaptation to cruise conditions. Reactions of the microvascular stream depended on the seamen's duties and functional state. They may be used to determine indicators of adaptation of seamen during long voyages. Figures 3; references 31: 22 Russian, 9 Western.

UDC 615.31:[547.95:547.943].03:616.3

**Dalargin (Opioid Hexapeptide) in Pathogenetic Therapy of Digestive Organ Disorders**

18400289a Moscow SOVETSKAYA MEDITSINA in Russian No 10, Oct 88 (manuscript received 20 Oct 87) pp 59-63

[Article by V. A. Vinogradov and N. P. Buglak, Simferopol Medical Institute]

[Abstract] The demonstration that endogenous opioids have systemic significance and that they and their specific receptors have been found in the digestive system have impelled studies of their role in the pathogenesis of digestive organ disorders. In the USSR extensive studies have been conducted with the synthetic hexapeptide dalargin, an analog of leu-enkephalin, which has been demonstrated to possess antistress potential; function as an anti-inflammatory, anti-ischemic, and immunoregulatory agent; and inhibit lipid peroxidation, one of the key mechanisms underlying many pathologic changes. Based on animals studies showing that dalargin inhibits pancreatic secretion of enzymes, therapeutic trials were conducted with 56 patients suffering from acute pancreatitis. The results were positive, with the progression of pancreatitis to more advanced stages halted. Experimental studies on cysteamine-induced gastrointestinal ulcers found confirmation in human trials in which dalargin was found beneficial in peptic ulcers, at least in part as a result of its normalization of gastric acid secretion. Further animal studies demonstrated that dalargin accelerates wound healing by 20% in a dose-dependent manner on both local application and intraperitoneal administration. Evaluation of the endocrine sequelae of dalargin administration to patients with duodenal ulcers showed that, in that respect, dalargin was innocuous, unlike cimetidine, which sharply increased prolactin secretion. Dalargin, therefore, has been shown to be an effective cytoprotective agent in a dose-dependent manner with apparently minimal side effects. References 44: 38 Russian, 6 Western.

UDC 612.014.49.06:613.863].08:612.397:547.915-39

**Role of Free-Radical Lipid Oxidation in Adaptation Mechanisms**

18400300a Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 11, Nov 88 (manuscript received 8 Apr 88) pp 49-54

[Article by M. G. Ayrapetyants and N. V. Gulyayeva, Institute of Higher Nervous Activity and Neurophysiology, USSR Academy of Sciences, Moscow]

[Abstract] Studying the mechanisms of adaptive-compensatory changes in the body caused by extreme factors is a fundamental biomedical problem. These changes may be adaptive-compensatory responses or a manifestation of a developing pathologic process. One of the leading pathogenetic components in the body's response to stress factors is the activation of free-radical lipid peroxidation; but its role in the damaging action of environmental factors, along with the significance of lipid peroxidation processes in the body's adaptive responses, has been studied very little, partially because of the difficulty associated with distinguishing adaptive responses from pathogenetic processes in a living organism. Western studies suggest that the response of the body to stress factors takes place in the context of a general adaptation syndrome, which includes three main phases: alarm, resistance, and exhaustion. Lipid peroxidation plays a key role in stress adaptation, increasing during the initial alarm phase and final exhaustion phase of general adaptation, decreasing during emergency and long-term adaptation; in the latter case, however, the peroxidation dynamics are a function of the stress factors and the body's characteristics. Combined preparations containing both lipid- and water-soluble antioxidants can be effective in the treatment of pathologies involving lipid peroxidation. Figure 1, references 25: 21 Russian, 4 Western.

UDC 615.357:577.17].015.4

**Does the Action of Externally Administered Regulatory Peptides Correspond to Their Physiological Functions in Plasma and Body Fluids?**

18400300b Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 11, Nov 88 (manuscript received 8 Apr 88) pp 55-64

[Article by I. P. Ashmarin, T. M. Yeroshenko, M. F. Obukhova and L. L. Trembovler, Institute of Normal Physiology imeni P. K. Anokhin, USSR Academy of Medical Sciences; Moscow State University]

[Abstract] A critical analysis is presented of the Soviet and Western literature on the results of experiments involving evaluation of the functions of the regulatory peptides—studies of the effects of systemic and central administration of minimum effective doses of these

compounds. The analysis is based on quantitative criteria which have been generated just in the past five years with the production of data on the concentration of many regulatory peptides in the body, particularly in blood plasma and cerebrospinal fluid, in the norm and in certain extreme conditions. In most of the studies reviewed, the doses tested are many times the maximum range of endogenous content of the regulatory peptides ( $\beta$ -endorphin, cholecystokinin, vasopressin and thyroliberin [TRH]), indicating that further studies of the physiological functions of these peptides must consider their actual concentration in the plasma and cerebrospinal fluid. Particularly important is an alternative path to the determination of the functions of a peptide regulator, by passive or active immunization against the regulator, resulting in selective reductions in its concentration with observation of the resultant "minus" physiological effects. References 108: 24 Russian, 84 Western.

UDC 612.825.5 + 577.151.17

**Effect of Tripeptide of Melanostatin on Electrical Activity of Surviving Sections of Rat Brain Olfactory Cortex**

18400306 Leningrad FIZIOLOGICHESKIY  
ZHURNAL SSSR IMENI I. M. SECHENOVA in  
Russian Vol 74 No 9, Sep 88 (manuscript received  
21 Dec 87) pp 1216-1220

[Article by A. A. Mokrushin, T. R. Bagayeva, I. A. Gerasimov, N. A. Yemelyanov, M. I. Mityushov, and S. M. Tikhomirov, Laboratory of Experimental Endocrinology, Institute of Physiology imeni I. P. Pavlov, USSR Academy of Sciences, Leningrad]

[Abstract] In recent years the attention of many neurobiologists has turned to the oligopeptides that form in the brain from peptide hormones and that have pronounced neurotropic effects. One of the more interesting ones is the melanostatin tripeptide (MST): prolyl-leucyl-glycine amide. MST forms during the splitting of oxytocin in certain processes of the brain, among them the median eminence. Several studies have shown that administration of MST to animals leads to behavioral changes: increased motor activity, enhanced excitation of conditioned reflexes, and various kinds of amnesia. The absence of mechanism of action of studies of MST's effect on CNS functions—especially the peptide's effect on the synaptic processes of excitation and inhibition at the cellular level—led the researchers to investigate the effect of MST on various parameters of the focal potentials associated with stimulation of the lateral olfactory tract in surviving sections of the olfactory cortex of male Wistar rats. Perfusion of the sections with  $10^{-5}$  M MST solution resulted in a depression of focal potential amplitude lasting about 6 min. Later, a prolonged increase of the components of focal potentials was observed. Baseline amplitude and configuration of focal potentials were recovered 40-60 min after the peptide was flushed out. The possible mechanisms of the long-term excitation effect of MST on the neural elements was discussed. Figures 3; references 15: 11 Russian, 4 Western.

UDC 616.832-001-085.844-036.8

**Experimental and Clinical Substantiation of Electrostimulation in Spinal Cord Damage**

18400307a Moscow ZHURNAL NEVROPATOLOGII I  
PSIKHIATRII IMENI S. S. KORSKOVA in Russian  
Vol 88 No 12, Dec 88 (manuscript received  
29 Mar 88) pp 5-8

[Article by V. V. Butukhanov, and L. V. Kaurova, Scientific Research Institute of Traumatology and Orthopedics, Irkutsk]

[Abstract] The paucity of data on the use of electrostimulation in spinal cord injury, the need for refinement of the indications for its use, and the wide variation of parameters that are used in the method itself led the researchers to perform experimentation involving the evaluation of the possibility of electrostimulation of the spinal cord below the location of a trauma to restore motor functions and correct autonomic functions. Experiments were performed on 54 cats with spinal cord trauma at the D<sub>11</sub> and D<sub>12</sub> levels. Slow-wave electrical activity was observed in all tested animals before trauma and, on a weekly basis, after it. The muscle tone of the posterior extremities, time of restoration of motor reflexes, urination and defecation reflexes, muscle atrophy and trophic skin disorders were also observed. Clinical tests were performed on seven patients who had had partial spinal cord trauma of several days to 11 years in the cervical area (in four patients) and the thoracic area (in three). Electrostimulation was found to have a significant influence on the dynamics of autonomic and somatic functions, improving muscle tone in the posterior extremities of the cats and the motor and autonomic functions in the human patients. References 9: 6 Russian, 3 Western.

**Features of Lymphopoiesis in Acute Hypobaric Hypoxia**

18400318b Leningrad TSITOLOGIYA in Russian  
Vol 30 No 10, Oct 88 (manuscript received  
23 Jan 87) pp 1242-1246

[Article by L. V. Filev, T. N. Petrova, I. V. Bykhovets, S. F. Yenokhin, N. N. Kotsyubinskiy and D. I. Korotkov, Military-Medical Academy, Leningrad]

[Abstract] In a study of the features of lymphopoiesis in acute hypobaric hypoxia in humans, 10 male volunteers were kept for 48 hours under hypobaric conditions corresponding to an altitude of 4,000 m above sea level. Determinations included the following: the number of leukocytes and the leukocytic formula; the percentage of irreversibly damaged leukocytes and leukocytes in paranecrosis; the relative and absolute content of T-lymphocytes, B-lymphocytes, and "zero"-lymphocytes; the percentage of blast-transformed lymphocyte forms; the mitotic indices of T-lymphocytes in 72-hour cultures; nucleole organizer activity in PHA-stimulated lymphocytes; the morphologic types of nucleoli in T-lymphocytes; and the percentage of metaphases with chromosomal aberrations and achromatic



damage in 72-hour cultures. Results indicated the destructive influence of hypobaric hypoxia on the leukocytes, with an increase in mutagenesis in T-lymphocytes. "Dead" and paranecrotic cells are known to be a powerful antigen stimulant to the immune system, and increasing the antigen factor creates conditions for the formation of autoimmune reactions. Since T-lymphocytes are regulators of truncl hemopoietic cell differentiation in the erythroid or myeloid direction, mutagenesis in T-lymphocytes can be assumed to play an important role in the development of high-altitude erythrocytosis. References 10: 7 Russian, 3 Western.

UDC 612.822.6:612.014.42:616-003.725

**Influence of Oxytocin Application on Helix Pomatia Neurons: Depolarization Effects**

18400335a Kiev NEYROFIZIOLOGIYA in Russian  
Vol 20 No 5, Sep-Oct 88 (manuscript received  
2 Sep 87) pp 652-659

[Article by N. I. Kononenko and O. N. Osipenko,  
Institute of Physiology imeni A. A. Bogomolets, Ukrainian Academy of Sciences, Kiev]

[Abstract] Results are presented from a study of the depolarizing responses of *Helix pomatia* neurons to the application of oxytocin. Oxytocin was applied to the soma of the neurons, which were studied at 18-22°C through a single- or double-column microelectrode or by pressure through a micropipette. The results indicate that some neurons of *H. pomatia* have oxytocin receptors, since application of the peptide results in depolarization of the neuron membrane and development of an oxytocin current apparently as a result of an increase in permeability of the membrane for chlorine ions. Oxytocin acts as a neuromediator or neurohormone in the central nervous system of mollusks, particularly in *H. pomatia*, where its effect on neurons leads to activation of chlorine conductivity of the neuron membrane. This process apparently involves a cascade of cytoplasmic responses related to the cell cyclase system. Figures 6, references 19: 2 Russian, 17 Western.

UDC 612.822.6:612.014.42:616-003.725

**Influence of Application of Oxytocin on Helix Pomatia Neurons: Hyperpolarization Effects**

18400335b Kiev NEYROFIZIOLOGIYA in Russian  
Vol 20 No 5, Sep-Oct 88 (manuscript received  
2 Sep 87) pp 659-666

[Article by N. I. Kononenko and O. N. Osipenko,  
Institute of Physiology imeni A. A. Bogomolets, Ukrainian Academy of Sciences, Kiev]

[Abstract] Results are presented from a study of the hyperpolarization effect of the application of oxytocin on the neurons of *H. pomatia*. Experimental methodology, electrical apparatus, solutions and experimental conditions are not described (they are found in Kononenko, Osipenko, NEYROFIZIOLOGIYA, 1983, Vol 15,

No 3, pp 327-329; *ibid.*, 1988, Vol 20, No 5, pp 652-659). The results indicated that some neurons are hyperpolarized upon application of the neuropeptide. Typical neuron responses are illustrated graphically. The data indicate that in addition to the depolarizing effect described previously, oxytocin can depolarize other neurons or hyperpolarize the membranes of certain neurons in *H. pomatia* cells. This leads to inhibition of electrical activity of the cell or a decrease in the frequency of response generation in neurons with natural activity. The hyperpolarization of the neurons may have various mechanisms, perhaps a decrease in chlorine conductivity, elsewhere an increase in potassium conductivity. The results indicate existence in some mollusk cells of three types of oxytocin receptors with different properties, indicating that the cells form a convenient model for the study of properties of these receptors and mechanisms of peptide transmission in the central nervous system. Figures 6, references 25: 6 Russian, 19 Western.

UDC 616.24-002-092.9-06:616.24-008.4-615.835.3.014.  
6:615.451.234

**Liposomal Treatment of Respiratory Hypoxia in Experimental Pneumonia**

18400337a Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in  
Russian Vol 106 No 10, Oct 88 (manuscript received  
16 Jun 87) pp 421-423

[Article by S. A. Bryginskiy, A. V. Zubarenko, V. K. Lishko, T. D. Minyaylenko, V. P. Pozharov, Ye. V. Rozova, M. M. Seredenko and A. V. Stefanov, Department of Neurochemistry, Institute of Biochemistry imeni A. V. Palladin, and the Department of Hypoxic Studies, Institute of Physiology imeni, A. A. Bogomolets, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] The demonstration that liposome administration appears to favor blood oxygenation led to experimental trials with liposomes in the treatment of hypoxemia resulting from experimental acute focal pneumonia. The studies were conducted on white rats (100-160 gm) treated 4 days after the onset of pneumonia with a liposomal lipid (egg lecithin) per 100 g body weight. biochemical and pulmonary function tests 8 days after the onset of the disease showed that inhalation of the liposomes was, in general, beneficial. The respiratory rate, respiratory volume, minute volume alveolar ventilation, and blood oxygenation recovered to normal or near-normal levels; whereas in untreated rates these parameters showed considerable departure from normal baseline levels. Blood levels of malonic anhydride indicated that the liposomal therapy was effective in minimizing the degree of lipid peroxidation, and also favored recovery of normal blood pH and lactate concentration. Histologic studies also demonstrated that the liposomes appeared to exert an anti-inflammatory effect in the pulmonary tissues. In summary, liposomal therapy appeared efficacious in limiting destructive changes in



the lungs and in correcting metabolic derangements. Figures 1; references 14: 11 Russian, 3 Western.

UDC 616-001.36-07:616.151.4-07

**Hemorheologic Disturbances in Shock of Varying Etiology**

18400337b Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 10, Oct 88 (manuscript received 19 Sep 87) pp 426-428

[Article by Z. M. Likhovetskaya, T. A. Prigozhina and N. A. Gorbunova, Laboratory of Pathologic Physiology, Central Scientific Research Institute of Hematology and Blood Transfusion, Moscow]

[Abstract] Comparative studies were conducted on blood rheology in 300-400 g male Wistar rats to assess the effects of traumatic, hemorrhagic, and burn shock. The studies, conducted in both compensatory and decompensatory phases, demonstrated that in terms of hematocrit, dynamic viscosity, pH, and red cell deformability the most pronounced adverse changes in blood rheology were seen with burn shock, while the least pronounced changes were observed with hemorrhagic shock. The severity of the changes with burn shock were attributed to the serious nature of the underlying pathogenetic mechanisms, involving hemoconcentration, loss of plasma, and deterioration of the erythrocytes. The demonstration that different forms of shock entail significantly different sequelae in terms of blood rheology may find reflection in therapeutic modalities. Figures 1; references: 9 Russian, 6 Western.

UDC 615.919.579.842.23].015.4:  
[616.153.453+616.154.37

**Effects of Y. Pestis 'Mouse' Toxin on Carbohydrate Metabolism in Rats**

18400337c Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 10, Oct 88 (manuscript received 14 Dec 87) pp 428-430

[Article by T. D. Cherkasova, P.R. Vengrov, V. A. Yurkiv and V. P. Avrorov, Central Scientific Research Institute of Epidemiology, USSR Ministry of Health, Moscow]

[Abstract] Biochemical monitoring was conducted on rats following intravenous administration of Y. pestis 'mouse' toxin, in order to assess the underlying mechanisms of action of this toxin in biochemical terms. The studies with 150-200 g Wistar rats showed that administration of 0.5 mg (LD<sub>50</sub>) of the toxin led to immediate onset of hypoglycemia, with the blood glucose falling from 127 +/- 4 mg percent at time 0 to 59 +/- 9 mg percent in 5 h. Lactate levels, although showing some fluctuation remained relatively stable. Plasma glucagon levels were elevated and, at 5 h, reached 5193 +/- 713 pg/ml vs. 580 +/- 71 pg/ml at time 0; concomitantly,

insulin levels fell from 565 +/- 83 pmoles/L at time 0 to 71 +/- 32 pmoles/L in 5 h. Hepatic concentrations of cAMP in that time frame rose from 101.9 +/- 12.3 to 179.5 +/- 18.6 pmoles/g. The data demonstrated that the effects of the toxin on carbohydrate metabolism did affect regulation of the adenylate cyclase system by glucagon, but were evidently due to a direct inhibition of gluconeogenesis. References 14: 1 Russian, 13 Western.

UDC 615.384:678].015.4:612.143

**Effects of Drag-Reducing Polymers on Systemic Hemodynamics**

18400338a Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 11, Nov 88 (manuscript received 3 Jun 87) pp 533-536

[Article by I. V. Gannushkina, M. V. Kameneva and A. L. Antelava, Scientific Research Institute of Neurology, USSR Academy of Medical Sciences; Institute of Mechanics, Moscow University imeni M. V. Lomonosov]

[Abstract] An analysis was conducted on the systemic hemodynamic effects of intravenous infusion of a drag-reducing polymer in chinchilla rabbits. The animals were pretreated with heparin (500 U/kg) and infused with polyethylene oxide WSR-301 over a 3-5 or a 15-20 min period. The concentration of the solution (5 x 10<sup>-4</sup> g/ml) was calculated to yield a polymer dose of 2 x 10<sup>-6</sup> g/ml blood. Hemodynamic monitoring showed that the immediate negative hemodynamic sequelae of rapid administration were avoided with essentially identical results. The data showed that 72 h after infusion the mean blood pressure remained some 13 percent below baseline levels, minute volume was some 15 percent above the baseline, and peripheral vascular resistance—in absence of vasodilation—was 20-25 percent below the baseline control levels. The drag-reducing polymer was thus shown to be effective in securing a prolonged hypotensive effect and may also be used in monitoring susceptibility to rheologic changes by the use of rapid and slow infusion rates. Figures 1; references 5: 4 Russian, 1 Western.

UDC 616.12+616.36]-008.939.15-39-092.9-02:616.831-008.939.15-39]-02:613.863

**Selective Inhibition of Cerebral Lipid Peroxidation In Stress**

18400338b Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 11, Nov 88 (manuscript received 9 Oct 87) pp 542-544

[Article by F. Z. Meyerson, Yu. V. Arkhipenko and V. V. Didenko, Scientific Research Institute of General Pathology and Pathologic Physiology, USSR Academy of Medical Sciences, Moscow]

[Abstract] A study was conducted on lipid peroxidation in the brain during stress induced by immobilization for 1 to

12 h, in order to determine whether protective mechanisms exist to protect this key organ from stress-induced damage. The studies were conducted on 200-220 gm male Wistar rats, with comparative data also obtained for the rate of lipid peroxidation in the liver and the heart. In vivo studies, based on the determination of tissue levels of malonic dialdehyde, showed that with 1-6 h of stress, the rate of lipid peroxidation was 3-fold higher in the heart and the liver than the control value, whereas in the brain the rate of peroxidation was 2.3-fold lower. Similarly, in vitro determinations on the induction of lipid peroxidation in the brain, heart, and liver homogenates showed that 1 h of immobilization enhanced the rate of lipid peroxidation in the heart and the liver and attenuated the process in the brain homogenate. After 12 h of immobilization the degree of lipid peroxidation was essentially identical for all three organs. These findings demonstrated that protective mechanism exists in the CNS that appears to limit brain damage due to lipid peroxidation over a period of some 6 h. Additional studies also revealed an inverse relationship in control animals between baseline lipid peroxidation in the liver and the brain: animals with high baseline levels of lipid peroxidation in the liver had low baseline levels of lipid peroxidation in the brain. The latter fact may indicate that emotional lability may be related to inherent differences in the degree of lipid peroxidation in the brain. Figures 1; references 7: 5 Russian, 2 Western.

UDC 616.36-018.1-02:612.766.2]-07

**Effects of Prolonged Hypokinesia on Circadian Pattern of Hepatocyte Proliferation**

18400338d Moscow BYULLETEN

EKSPERIMENTALNOY BIOLOGII I MEDITSINY in Russian Vol 106 No 11, Nov 88 (manuscript received 25 Dec 87) pp 610-611

[Article by S. Ye. Li, Department of Physiology and Pharmacology, Institute of Marine Biology, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok]

[Abstract] An analysis was conducted on the effects of 10-day enforced hypokinesia on the pattern of hepatocyte proliferation of 150-160 gm male Wistar rats. Hypokinesia of this duration retarded body weight gain by 32.3 percent and hepatic weight gain by 42.1 percent. Concomitantly, histologic examinations showed that the mitotic index was decreased 8.28-fold by comparison with the value for hepatocytes of control rats. Peak mitotic activity occurred at 1500 hours, while counts of binucleate cells fell to a minimum at 2300 h, remaining stable throughout the rest of the circadian cycle. In general, the binucleate counts for the experimental animals exceeded those for control animals 1.65- to 1.73-fold. On balance, the circadian pattern of activity for hepatocyte proliferation was identical to that observed for control animals. However, the lower level of mitotic activity led to an increase in the number of binucleate hepatocytes as a compensatory mechanism intended to provide adequate hepatic function. References 16 (Russian).

UDC 612.83:612.014.42:612.434.14

**Influence of Vasopressin and Oxytocin on Dorsal Root Potentials in Isolated Perfused Neonatal Rat Spinal Cord**

18400355 Kiev NEYROFIZIOLOGIYA in Russian

Vol 20 No 6 Nov-Dec 88 (manuscript received 22 Oct 87) pp 757-763

[Article by Z. A. Tamarova, Institute of Physiology imeni A. A. Bogomolets, Ukrainian Academy of Sciences, Kiev]

[Abstract] The application of vasopressin or oxytocin to isolated spinal cord segments modulates the dorsal horn neuron response to afferent stimuli. This article presents a study of the presynaptic influence of vasopressin and oxytocin on the spinal cord. The processes occurring at afferent fiber endings were used to determine the dorsal root potential, the negative component of which reflects the depolarization of primary afferent central terminals. Both substances caused reversible depression of the dorsal root potential following stimulation of neighboring dorsal roots and reversible dose-dependent depolarization of the dorsal root. The functional significance of the presynaptic influence of vasopressin and oxytocin is probably a limitation of afferent inflow to the brain in certain pathologic states and during pain. It is known that nociceptive irritation increases the activity of vasopressinergic neurons in the hypothalamus. Figures 5; References 11: 2 Russian, 9 Western.

UDC 612.821.6

**Transplantation of Embryonic Neural Tissue Normalizes Acquisition of Active Avoidance Behavior in Rats Disturbed by Acute Hypoxic Hypoxia**

18400349d Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 304 No 5, Feb 88 (manuscript received 22 Jun 88) pp 1262-1265

[Article by S. V. Girman and I. L. Golovina, Institute of General Genetics imeni N. I. Vavilov, USSR Academy of Sciences, Moscow]

[Abstract] Shuttle chamber-type experiments were conducted on young, 150-170 gm, female Wistar rats to assess hippocampal function in acquisition of learned avoidance behavior following an episode of acute hypoxic hypoxia (3 min at 120 mmHg pressure). The trials were conducted with various series of rats subjected to different procedures including cortical lesions, hippocampal lesions, and cortical neural transplants from 17-day-old embryos. Training and testing were conducted 2.5 to 3 months after surgical intervention. Studies with control rats demonstrated that an episode of acute hypoxic hypoxia had no telling effect on normal behavior patterns and responses. There were no significant differences between control rats and rats with surgical cortical lesions. The best learning pattern was seen in rats with hippocampal lesions that were not subjected to

hypoxia, followed by animals subjected only to the episode of hypoxic hypoxia. Transplantation in the animals subjected to hypoxia led to a learning pattern characteristic of the control rats, i.e., transplantation overcame the enhancing effect of the hypoxic episode. Both an episode of acute hypoxia and the hippocampal lesion induced a greater degree of intersignal mobility which was correlated with the superior performance in the avoidance test. Although transplantation facilitated recovery of normal-type learning pattern, it was without effect on the elevated level of intersignal mobility. Figures 2; references 8: 2 Russian, 6 Western.

UDC 612.822.3+612.63

**Responsiveness of Somatosensory Rat Cortical Neurons Transplanted Into Neocortical Vibrissa Representations to Electrical Stimulation of Recipient Brain**

18400358c Moscow *ZHURNAL VYSSHEY NERVENOY DEYATELNOSTI IMENI I.P. PAVLOVA in Russian* Vol 38 No 6, Nov-Dec 88 (manuscript received 16 Apr 87) pp 1098-1106

[Article by A. G. Bragin, A. Bone (Bohne) and O. S. Vinogradov, Institute of Biological Physics, USSR Academy of Sciences, Pushchino; Institute of Neurobiology and Brain Research, GDR Academy of Sciences, Magdeburg]

[Abstract] An analysis was conducted on the responsiveness of grafted neuronal tissue in cortical barrel field (BF) projection sites, using embryonal somatosensory cortical explants and young recipient rats. The specific model consisted of cortical tissues derived from 17-18-day-old Wistar rat embryos transplanted into homotypic sites in 15-180 gm Wistar rats. Electrophysiological studies on responsiveness of the transplanted tissues were conducted 3-8 months after transplantation, with right-angle electrical stimulation (0.1 msec, 0.3-30 pulses/sec, 200-600  $\mu$ A) of the ventrobasal thalamic complex, the posterior thalamic nuclei, and the contralateral BF projection area. The data showed that 2 of the 12 transplants failed to respond, a fact attributed to the formation of an underlying glial-connective tissue barrier. The level of responsiveness to electrical stimulation of the various formation varied from transplant to transplant, encompassing from 30 to 95 percent of the neurons (7-80 percent in stimulation of the contralateral BF projection area). However, despite a lower level of responsiveness in comparison with control (untransplanted) somatosensory areas, a normal pattern with respect to the stimulated area and latent times was noted. Thus, despite the fact that overall reactivity and convergence was below control values, the results confirmed the establishment of functional afferent connections to the transplants from the thalamic and neocortical regions of the recipient brains. Figures 4; references 24: 6 Russian, 18 Western.



**Chernobyl Radiation Medical Effects Noted**  
*18400504 Moscow PRAVDA in Russian 29 May 89*  
*Second Edition p 4*

[Article by Professor O. Pyatak, doctor of medical sciences; V. Matyukhin, academician of the USSR Academy of Medical Sciences; and Professor A. Tsyb, corresponding member of the Academy of Medical Sciences: "Chernobyl: Radiation and Health"]

[Text] PRAVDA readers S. Nurmagedov, V. Timofeyeva, A. Popov, P. Khabrenko, L. Bardagova, and others ask that we report on the effects of the Chernobyl accident on people's health.

We are responding to this request.

As a result of the accident in the fourth power-generating unit of the Chernobyl AES [nuclear power station], various degrees of radioactive contamination occurred in many regions. It was most distinctly apparent in Kiev, Zhitomir, Gomel, Mogilev, and Bryansk Oblasts, where the levels of contamination brought the complex problems of the security of the population to the attention of medical and other services.

Accident levels of overall individual irradiation dosage were established for the population of areas that were subject to the greatest radiation exposure: for the first year, up to 10 rem [roentgen equivalent] (which is 2.5 times lower than the permissible level of the accident irradiation of personnel); for the second year, 3 rem; and for the third year, 2.5 rem, which is 15.5 rem for the 3 post-accident years. What is the real magnitude of exposure dosages of various groups of the population?

In areas of strict control numbering 786 settlements and 272,800 persons: In the 3 post-accident years, the dosages for 62.1 percent of this population (in 431 settlements) were on the order of 1-5 rem; for 33.6 percent of the population (in 289 settlements), 5-10 rem; for 3.1 percent of the population (in 47 settlements), 10-15 rem, and for 1.2 percent of the population (in 19 settlements), 15-17.3 rem.

Now about the effect of Iodine-131. Here there are other tolerance levels.

The internal irradiation dosages of thyroid glands were established for 1.5 million persons (of whom 160,000 were children up to 7 years of age at the time of the accident) who were living in zones of the greatest Iodine-131 contamination. Estimates show that dosages for 87 percent of the adults did not exceed 30 rem; for 11 percent of the adults, the dosages were in the 30-100 rem range; and for 2 percent of the adults, the dosages exceeded 100 rem. For children, the distribution of dosage loads on the thyroid glands turned out to be

somewhat different: The dosage did not exceed 30 rem for 48 percent of the children; it was 30-100 rem for 35 percent of the children, and higher than 100 rem for 17 percent of the children.

Thus, we can say there are people who have increased dosages of overall irradiation, especially irradiation of the thyroid gland; it is they who are given priority attention and who are given thorough examinations with the involvement of endocrinologists, hematologists, and other specialists. Intensive work is going on now on a retrospective reconstruction of the scope of individual dosages in the entire population that was exposed to radiation, and, in the main, we will conclude it this year.

To arrive at an objective estimate of the state of health of the entire population exposed to radiation as a result of the accident, more than 600,000 persons (including 215,300 children) were given various kinds of medical examination in a short time. Almost 25,000 adults and 12,600 children were examined in permanent clinics and hospitals. All of this required the involvement of substantial medical forces and means. The entire network of health establishments of the Ukraine, Belorussia, and individual areas of the Russian Federation were activated in the very first days to provide effective medical assistance to areas with increased levels of radioactive contamination. About 2,000 physician-nurse teams were created, a considerable number of scientific workers were brought in, and also almost 7,000 physicians, 12,700 medium-level medical workers, more than 1,200 students in upper classes of medical institutes, and almost 2,000 specialists with engineering-technical qualifications for dosage-measuring operations. The number of performed observations and research reached many millions. The data obtained were analyzed immediately and summarized, and operational decisions based on them were made.

A special system, including the organization of new and the reinforcement of existing scientific and practical work establishments, was set up to look after the state of health and to provide the necessary medical assistance for persons exposed to radiation as a result of the accident of the ChAES [Chernobyl nuclear power station]. The leader on these problems in Kiev was the All-Union Radiation Medical Center of the USSR Academy of Medical Sciences consisting of three quite well-equipped institutes that have specialists of various profiles. Specialized republic dispensaries for the radiation protection of the population were organized in Moscow, Kiev, and Minsk. More than 1,000 additional medical worker positions were earmarked for work in the controlled areas. Medical equipment costing tens of millions of rubles was acquired. An Institute of Radiation Medicine of the BSSR Minzdrav [Belorussian Soviet Socialist Republic Ministry of Health] was organized in Minsk with a permanent facility and is in the process of formation. The scientific subject matter has been broadened in such specialized establishments of the country as the Institute of Biophysics of the USSR Minzdrav, the



Institute of Medical Radiology of the USSR Academy of Medical Sciences, the Leningrad Scientific Research Institute of Radiation Hygiene of the RSFSR [Russian Soviet Federated Socialist Republic] Minzdrav (which has opened a special laboratory in the city of Novozybkovo in Bryansk Oblast), and others.

An all-round ecological scientific program on the medical aspects of the accident at the Chernobyl AES, in whose implementation more than 150 institutions of various ministries and departments are taking part, was formed in a short time and is being implemented.

One of the most important indicators of the health of a population is its sickness rate—both in general and special types of illnesses. Until recently the computation of many illnesses was conducted on the basis of data of the turnover of patients in treatment facilities, which, of course, did not reflect the true situation.

It must also be taken into account that medical assistance for the population was not at the necessary level in all of these areas in the preaccident period. Therefore today in resolving the tasks of eliminating the consequences of the accident, we must simultaneously eliminate the defects in the work of previous years. Up to the present time, with rare exceptions, all residents living in controlled territories have been given the minimum of a twofold medical examination with a general analysis of blood and urine and an examination by a general practitioner, and, for women, also an examination by an obstetrician-gynecologist and consultations with specialists if there are any symptoms or patient complaints.

Now we have a rather full picture of the sickness rate of the population in these areas. It turned out to be higher for a number of illnesses than was registered before the accident, which gave to some journalists and even medical workers reason to come to the conclusion that this occurred under the influence of radiation. To arrive at reliable and well-grounded findings on the reasons for the changes in the sickness rate indicators in the controlled areas (a more complete calculation, improvement in the quality of diagnostics, the effects of radiation or other factors), a parallel study is being made of the state of health of the population in areas that are similar in other characteristics but which have not been exposed to the effects of radiation. Taking all of the circumstances that have been set forth into account, there must also be an evaluation of the Chernobyl accident on health at the present time and in the long term.

Particular attention is being given to the so-called critical subpopulation with the highest demonstrated sensitivity to the exposure of ionizing radiation (this, first of all, is pregnant women, babies, and children). About 200,000 children annually are sent out of zones with increased radiation for health improvement to sanatoriums and Pioneer camps. During the period of the Chernobyl accident, more than 2,500 women living in the evacuation zone were in various stages of pregnancy. All of the

necessary conditions were created for them, continuous medical monitoring was introduced, and many of them were housed in sanatoriums for the entire period. According to data of specialists, their course of pregnancy did not change in comparison with the preaccident period (nonetheless, a significant number of women refused to give birth to the baby). More frequent hemorrhaging was observed during childbirth in a number of cases, but no other substantial differences were found. About 1,600 children were born and the state of their health did not differ from the state of health of newborn babies in other areas. No radionuclides were found in the organisms of the newborn babies. As for the infant and maternal death rate, it dropped sharply in this group by comparison with the preaccident period. This is indicative of our reserves and capabilities to work in an effective way, and the fact that it is possible even in the post-accident period to improve sharply the state of health of mothers and babies.

Definite demographic shifts took place, and an increased migration of the population was noted during the post-accident years in areas that were exposed to radioactive contamination. The size of the reproductive adult group decreased, family planning strategy changed, and the birthrate dropped noticeably in a number of places. Nonetheless, up to the present time many thousands of women have enjoyed the happiness of motherhood in the controlled territories. The specialists do not note substantial changes in the character of the course of pregnancy and childbirth. The mortality rate for children up to 1 year of age are not increasing, and in some oblasts, given the better work of medical personnel, it is even dropping. Numerical data are given in the table.

Indices of Children's Death Rate (per 1,000 born)

Oblast, republic	Years			
	1985	1986	1987	1988
Kiev Oblast	13.6	10.4	11.9	10.7
Zhitomir Oblast	14.6	13.4	14.5	11.2
UkSSR	15.7	14.8	14.4	13.9
Gomel Oblast	16.3	13.4	14.1	12.1
Mogilev Oblast	14.2	12.8	11.9	13.0
BSSR	14.5	13.4	13.4	13.2
Bryansk Oblast	18.4	17.2	18.6	17.2
RSFSR	20.7	19.3	19.2	19.4

The evaluation of the status of the health of children after the Chernobyl accident must be accomplished keeping a number of circumstances in mind. The Polesye [woodlands] and some other radioactively contaminated areas had peculiarities in the structure and distribution of illnesses in the child population even in the preaccident period. Applicable here are endemic goiter (pathology of thyroid glands), focal infections, and iron deficiency anemia. An examination of the entire child population in 1986 up to 14 years of age revealed a rather significant distribution of chronic ailments of the throat and nasopharynx. Why did these indicators turn

out to be higher? In our firm opinion, it is a question first of all of an increase in the quality of diagnostics which enabled a better assessment of the existing illnesses.

It is impossible to ignore still another reason. A child's body and its immune system are very sensitive even to insignificant changes in living conditions. And here a change in place of residence, changes in living conditions, nourishment, a transfer to schools and children's extended-day institutions, acclimatization to a new group—all of this places a considerable stress on the compensatory-adaptive mechanism of a child's body, and it is frequently accompanied by an aggravation or development of illnesses. During the period 1986-1988, a relative stability in children's illnesses occurred in these areas, which argues against its causal relationship with radiation (because the total individual dosages of radiation for 2 years, although insignificant, still increased).

There were no substantial changes for 3 years in the overall structure of illnesses of the adult population. As among children, as a result of the conduct of continuous medical examinations and a fuller accounting, more illnesses were registered among adults than before the accident. Analysis showed that in many cases we are dealing with illnesses that existed before the accident and which were not found in a timely way, and that previous illnesses had become worse.

A fundamentally important question arises: If no changes have been found in the structure and frequency of illnesses in children and adults to this day, can we come to the conclusion that the Chernobyl accident did not affect the state of health of the population, and that we can be calm about the future? No, and no once more! First, because in later periods, especially with respect to persons who had large radiation dosages, indirect after-effects can result. Second, taking the concept of the so-called composite dosage into account, there is a risk in principle that inherent anomalies, oncological illnesses, and genetic aftereffects will develop. Third, and finally, the effect on health has to be evaluated not only from the standpoint of radiation exposure, but also from the standpoint of other factors connected to the Chernobyl accident: the evacuation of large masses of the population and the changes this causes in the usual daily routine and way of life.

In examining the possible indirect consequences of radiation, the problem of the action of radioactive iodine on the thyroid gland has the most meaningful role. Ionizing radiation in large dosages disrupts the activity of cells that process important hormones whose deficiency can lead to hypothyroidism and mixedema.

Many years of experience in the use of radioactive iodine for diagnostic and treatment purposes indicates a significant stability of the thyroid gland with respect to radiation factors, and the fact that a steady lowering of its function in adults necessitates exposure 10 times higher than the dosage of this radionuclide that was incurred in

the accident. The thyroid gland of children is somewhat more sensitive to radiation exposure, and the possibility is not excluded that hypothyroidism can occur among children in the course of 5-10 years after the accident. At a more distant time, some increase in the frequency of nodal forms of goiter and tumors of the thyroid gland are possible. The theoretical risk of the development of malignant tumors of the thyroid gland with a fatal outcome for the life span of the population of areas with the highest radioactive contamination, based on the size of the composite dosage, is 1 in 50,000 persons, and for children—1 in 12,000. The development of thyroid gland tumors occurs slowly and rather definite changes precede it. Their timely detection and appropriate treatment create real preconditions not only for improving the outcome of possible thyroid gland damage, but also for preventing it in many cases. Therefore, one of the important tasks is a continuous and prolonged observation of the state of the thyroid gland of the population in controlled areas and especially observation of children. For this purpose, endocrinological dispensaries have been established in controlled areas and endocrinological offices in each rayon hospital. Specialist endocrinologists are being sent to do this work, but they have to be equipped with modern diagnostic apparatuses.

Necessary research has been conducted since the first days of the accident and is continuing now. Many hundreds of thousands of analyses were performed during the so-called "iodine" period of the accident. A thyroid gland reaction in the form of slight abnormality, swelling, and an increase of its hormones in the blood was noted in the first weeks after the accident. These changes disappeared after several months. The alarm among the population about hyperplasia of the thyroid gland seen in the examination of children, is unfounded. In the 1950's in the Ukrainian and Belorussian Polesye [woodlands], hyperplasia of the thyroid gland was found in 30-40 percent of children and, as a rule, it passed with age. At the present time, among children and adults of the controlled territories of the UkSSR [Ukrainian Soviet Socialist Republic], BSSR, and RSFSR, not one case of radiation-caused thyroid gland illness has been registered in the form of hypothyroidism or nodal goiter (not to mention its malignant tumors).

One of the earliest indirect aftereffects is severe leukemia. In areas exposed to radiation contamination, the preaccident level of these illnesses is being maintained and according to the data of specialists, no cases of "redundant" severe leucosis in children were registered. According to the prognosis of scientists, the total increase in the rate of leukemia illnesses caused by the Chernobyl accident in areas of strict control (273,000 residents) can constitute from 1.5 to 2.1 percent by comparison with the usual "spontaneous" level of a given illness; that is, 1-1.5 possible additional cases of illness for 1 million persons in a year.

Malignant new growths are also categorized among the indirect aftereffects of radiation exposure, and an increase in their frequency can begin no earlier than 5-10

years later depending on many reasons (size of the dosage, age, the presence of other illnesses or factors that contribute to carcinogenesis, and others). An estimate of the degree of risk of the occurrence of tumors caused by radiation is not possible without an overall analysis of the distribution of these illnesses. In the last 10-15 years, a noticeable increase has been noted in oncological pathology, especially in the economically developed countries. In Western Europe, for example, in a lifetime new malignant growths occur in 30 percent of men and in 25 percent of women, and by the year 2000 the overall risk can increase to 35 percent. The probability of an American becoming ill with cancer in a lifetime is now 35 percent, and by the end of the century it will increase to 45 percent. Specialists believe that cancer will already be the main cause of death among the U.S. population in 1995, putting cardiovascular illness in second place. In the USSR now tumors occur during the lives of about 27 percent of men and 18 percent of women, and an increase has been occurring in their frequency in the last 5-10 years (the rate of illness is growing annually by 1-4 percent). It is extremely difficult against this background to identify the tumors that developed as a result of exposure to ionizing irradiation. According to preliminary prognoses, they can increase the number of cases of oncological illnesses with fatal outcomes in areas of strict control by 0.5-0.7 percent (5-7 out of 1,000 cases of "normal" spontaneous deaths from cancer, and in other areas that were subject to radioactive fallout, their general level can increase by 0.01-0.04 percent—1-4 cases out of 10,000 cases). There are no data at the present time concerning cases of oncological illnesses whose occurrence can be associated with the Chernobyl accident. The frequency and distribution of new malignant growths in the controlled areas change in the same degree as in areas that have not been exposed to radioactive contamination.

An important task of our health services is not only to estimate the state of health of the population that has been exposed to radioactivity as a result of the Chernobyl accident, but also to implement effective preventive and treatment measures that are aimed at eliminating or reducing possible negative aftereffects to the maximum possible extent. Special attention must be paid to groups of the population who are at an increased level of risk. This purpose is served by the all-union distribution register of persons exposed to radiation in connection with the accident at the Chernobyl AES. Many hundreds of scientists and specialists are working on its creation and use.

A further refinement and lowering of exposure dosages is of paramount significance. Iodine prophylaxis, evacuation from the 30-kilometer zone, the decontamination of work, a switch from local food products to products brought in from the outside, the removal of pregnant women and children for health improvement purposes, and other measures, reduced by many times the amount of possible exposure dosages, in particular, 50-80 percent of the possible irradiation dosages of the thyroid gland.

At the present time, Soviet scientists-physicians have received detailed information on the magnitude of irradiation dosages that the people living in each settlement in controlled areas will receive for the rest of their lives. A scientifically based maximum radiation dosage limit of 35 rem to the year 2060 has been established in our country for inhabitants of these areas. Calculations have been made of expected dosages for the entire future life of residents in these areas given the removal of all restrictions on the consumption of products produced on the personal plots of land in areas of strict control.

This limit will be maintained in 69.2 percent of the settlements where 79.4 percent of the population of controlled areas live; in 17.7 percent of the settlements (14.1 percent of the population), it will be necessary to implement additional measures. But in 13.1 percent of the settlements with 6.5 percent of the population, the expected dosage may exceed the established limit, and it will be necessary to decide the question of resettling the inhabitants. One cannot remain silent about the fact that about 1,000 persons (avoiding checkpoints) returned to the homes from which they were resettled without authorization. The union and republic ministries of health and their local organs and facilities have always considered such an unauthorized return, particularly the return of children, to be impermissible before the performance of the necessary decontamination and other measures for the creation of normal living conditions. This must be evaluated as directly damaging to one's health.

In the process of studying the state of health and the conduct of medical examinations of the population that was subject to radiation exposure, specialists turned their attention to the fact that some illnesses are not occurring and appearing in the usual manner. This peculiarity is conditioned first of all by nervous-somatic disorders that are frequently observed in the population of controlled areas, and they are expressed most frequently of all in the form of autonomic dysfunctions. In executing direct "control" of the activity of many internal organs, the autonomic nervous system, when it malfunctions, contributes not only to a disturbance of the functions of organs, but also to the development of illnesses. The most important factor in the development of autonomic dysfunction, is stress, nervous mental tension. We also encountered the so-called radiation phobia, talk about which many persons perceive to be an insult, as a charge of simulation, and as a contrast to "real" illnesses, which is absolutely incorrect. From the standpoint of the physician, radiation phobia can be defined as an increased psychoemotional reaction to a real or imagined danger of radiation. It is included in the group of a special type of neurosis, and consequently it requires diagnostics, prophylaxis, and treatment. Radiation phobia is a very serious problem. Initial functional



and completely removable changes during further development can show up in the form of cardiovascular and gastrointestinal and other illnesses with organic damage to internal organs.

Radiation phobia has not only a medical, but a social side as well. There is a need for scientifically based and truthful information, and an increased radiation literacy of the entire population. After the Chernobyl accident, many incompetent articles appeared in the press that directly or indirectly concerned questions of the health of the population, and they often gave rise to various kinds of conjectures and rumors and a mood of panic. The authors of these writings are not aware that the injection of fear and tension is a source of direct damage to the health of the population.

We do not conceal our difficulties and shortcomings in the tremendous work of eliminating the medical consequences of the accident. There were deserters among the physicians who left the areas stricken by radiation; not everyone performs his professional duty conscientiously and there are exaggerations in work that is being done; effective prophylactic work and clinical examinations of the population exposed to radiation have not been arranged properly everywhere; and many physicians and middle-level personnel display incompetence on questions of radiation medicine. We must understand that the elimination of the aftereffects of the accident will require dozens of years of intensive work, that we are proceeding consciously from the most unfavorable prognoses, and that we must be ready to cope with assigned tasks. To preserve the health of the population that was exposed to radiation, we need urgent help and support. Local organs and establishments do not have an adequate amount of modern dosage-measuring and diagnostic apparatuses, and special kits for immunological, endocrinological, hematological, and cytogenetic research. It is not possible to purchase everything that is needed from capitalist firms; therefore, domestic industry must become proficient in their output quickly.

A number of social questions are not being resolved satisfactorily in strict control areas. Products being brought in often do not satisfy the needs of the body in the most important substances (animal protein and vitamins), which are especially important to children. There is a need for more coordinated work of the health services organs and national education and a more active part in it by teachers and workers in children's preschool establishments. An expansion in the motor activity of children, the strengthening of their character, the provision of good nourishment, and the upbringing of a healthy child are of vitally important significance.

Inasmuch as the agricultural areas were exposed to the most radiation, there are a number of serious questions for local organs as well. Decontamination was conducted primarily in settlements and, to a lesser degree, on farmland. Therefore, additional protective measures are needed for field crop growers, machine operators, and

cattlebreeders. Unfortunately, it is by far not everywhere that they have been implemented. There is an absolutely inadequate number of agricultural machines with airtight cabins, there are few special clothes, and their processing is performed in an absolutely unsatisfactory manner. There is a shortage of showers where each worker would have an opportunity to go through a sanitary (in fact, decontamination) process and have a change of clothes. The result of these defects is additional dosages and the carrying of radioactive matter into living accommodations.

In conclusion, not removing the primary responsibility from health services organs, we want to emphasize once more that the preservation of the health of the population in a zone affected by the Chernobyl accident is a nationwide state matter, and only through our joint efforts will we be able to eliminate the aftereffects of the tragedy we have endured.

**Health Care Weak Points Discussed by L. Karu, Estonian Minister of Health**  
*18400271 Tallinn KOMMUNIST ESTONII in Russian*  
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[Article by L. Karu, Estonian Minister of Health: "Weak Points in Health Care—L. Karu, Estonian Minister of Health, Delegate to the 19th All-Union Party Conference, Has the Floor"; when L. Karu wrote the article, a footnote explains, he was working as chief physician at the Tartu Clinical Hospital and was, at that time, also the president of the Estonian Physicians' Union]

[Text] Seven years ago, in 1981, the World Health Assembly of the UN approved a program entitled "Health for All by the Year 2000," which brought the attention of the world community to the most important and, at the same time, extremely complicated social and biological problem—human health.

In this period of restructuring, when the frequently burdensome legacy of the past is being analyzed frankly and comprehensively in different areas of life, many weak points in the social policy have also come into sharp focus, particularly such an important area as protection and strengthening of the health of people. As we know, at the 27th Party Congress, emphasis was laid on the need to implement an active, people-oriented social policy. The resolution adopted by the 19th Party Conference on progress in implementation of the decisions of the 27th CPSU Congress and on the tasks associated with the expansion of restructuring lists mandatory implementation of programs in the area of health care and the directly related task of environmental protection as being among the objectives of paramount importance.

Which are the most acute problems that must be solved?



Before we discuss them, let us try to explain the concept of "health" and the methods of measuring it and the factors that affect it. Without that it would be impossible to analyze the situation and map out the steps that are needed.

Paradoxical as it may seem, there is still no single interpretation of the concept of "health." The definition provided by World Health Organization experts is often used: health is not only the absence of disease or defects, but also a general state of social and mental well-being.

But that definition does not eliminate ensuing questions such as, what is a state of social or mental well-being? For this reason, various indirect parameters are used to assess the state of public health: birth rate, death rate, population growth, incidence of diseases, infant mortality, disability and so forth.

The World Health Organization of the UN uses parameters such as the following to assess health in specific regions: —Percentage of gross national product spent on health care —Availability of primary health and medical care —Number of residents with a safe water-supply —Percentage of public vaccinated —Medical care for pregnant women and neonates —Status of child nutrition —Infant mortality, etc.

Such a selection of parameters indicates that emphasis is laid mainly on assessment of general standard of living and level of culture of a society (or a region or state). And that is logical, since the health of people and of a society depends more on socioeconomic factors than on strictly medical factors.

With reference to health, we should consider ecological factors (climate, cleanliness of the environment), economic factors (diet, financial security, relationship to property, etc.), and social factors (an individual's status in society, nationality, interpersonal relations), as well as genetic and individual psychological factors. Hence the difficulty of analyzing public health and factors affecting it. With such complexity, an important role is played by life-style and people's awareness and activity oriented toward the preservation and strengthening of their health.

As for life-style, the nature and organization of labor affect health; sociopolitical activity and range of family obligations, which, however, are rather difficult to define, are also rather important. Life-style should be seen as the result of the interaction of various factors at the individual level, as well as at the regional (or national) level.

Without delving into discussion of social health care, let us now examine the health of the population of Estonia based on some examples.

Here, we immediately encounter one of the most difficult problems, which is **the lack of reliable information**. For example, we have virtually none of the information needed about environmental (air, water, soil) pollution or about the composition and contamination of food we consume.

About 1,500 compounds that are present in the environment and that affect human health are considered and evaluated within the framework of international collaboration. The USSR has not adhered to that international convention, and we consider only 300 compounds to be important, only 17 of which are measured in the environment. Thus, the lack of instruments for analysis and the secret classification of existing data has more than limited our knowledge about the environment. Moreover, no reliable analysis has been made in Estonia of region-by-region morbidity rate or the incidence of the principal forms of diseases. Nevertheless, I shall try to provide at least some idea about this.

#### Birth Rate, Death Rate and Population Growth

The birth rate ranges from 12 to 19 per 1000 population in developed countries. Last year, it was 16.0 in Estonia, which is 0.4 higher than in 1986. Mortality rate in this republic was 11.7 per 1000 last year. Thus, there was an increment of +4.3. How are we to assess these indicators?

It should be noted that the birth rate in this republic is comparable to the figures for Finland, Great Britain, Czechoslovakia and Poland. Overall mortality rate is no higher than in most countries; it is lower in Japan, the United States, Yugoslavia, Poland and Finland. But, obviously, something else is more important: population growth among Estonians is considerably lower than that among people of other nationalities living in Estonia, which means, in essence, that there has been a further decline in the percentage of Estonians among the inhabitants of Estonia. Estonia is third from last among Union republics with respect to population growth, being ahead of only the Ukraine and Latvia. The republics with the highest population growth are Tajikistan (32.4), Uzbekistan (28.8), Turkmenistan (27.0), Azerbaijan (19.8) and Armenia (18.4), with Armenia having the lowest mortality rate (5.8). Along with Latvia, we are among the demographically aging states.

Upon scrutinizing the causes of mortality in Estonia (last year's data), we find that cardiovascular diseases—**ischemic disease and cerebrocirculatory diseases**—are in first place, followed by tumors, trauma and poisoning. Hence the need to intensify the battle against cardiovascular diseases and tumors. Disease prevention (primarily by changing an individual's life-style), early detection of disease (seeking aid promptly and modern equipment) and, considering the age of the population and the attendant high incidence of chronic diseases, adequate supply of medication are very important. The rise in deaths due to cardiovascular disease observed in recent

years is probably related to the general and acute shortage of cardiac drugs, which, of course, is utterly unacceptable. In Estonia, the shortage of drugs has, in general, worsened. In 1986-1987, the USSR Gosplan stopped purchasing about 70 imported drugs. There are no domestic analogues for most of them.

The highest overall mortality rates are found in the Kokhtla-Yarveskiy, Pylvaskiy, Tartuskiy and Vilyandiski rayons. It should also be noted that the mortality rate is 30 percent higher among the rural population than among the urban population.

The mortality rate among children 1 year old or younger per 1000 neonates is one of the most reliable and sensitive indicators of health status. In 1985, it stood at 26.0 in the Soviet Union, and our country was in 51st place in the world in this respect. It is 7-25 in developed countries, and last year it was 16.4 in Estonia. Compared with Sweden (6.9), Japan (7.5), Finland (7.7), or Denmark (8.4), we have nothing to brag about. Infant mortality within the first 7 days of life is particularly high in our republic, mainly the result of premature births, congenital organ defects, and diseases acquired in utero. Consequently, the causes have more to do with maternal diseases and bad habits than with infant disease.

#### **Health, Life-Style and Working Conditions Among Mothers**

It is stated in the CPSU Program that further improvement of the status of mothers is a subject of constant concern for the party. I discussed the steps that should be undertaken in this area at the 11th Plenum of the Central Committee of the Estonian Communist Party.

As we know, more than 30,000 of our women work under conditions that are deleterious to health. The situation is aggravated by stress factors, poor diet, sedentary life-style, etc.

If our goal is to do something meaningful to improve the health of the population of Estonia, we must advance the protection of mother and child to a higher level, no matter how difficult the task. It would involve not only reducing hypodynamia among women and improving their diet, but also freeing women of child-bearing age from working under conditions that are overtly deleterious to their health (such as noise, vibration, dust, and chemicals). The transfer of more than 30,000 women to different jobs would be a complicated task, from both an economic and an ethical standpoint. Another solution would be to radically change working conditions, i.e., production or maintenance technology. But that would require billions in currency, which, of course, to come up with; and implementation would extend over many years, even if the money were available.

Under present conditions, transfer to a different job usually involves a drop in wages, and for that reason the women themselves express their agreement to work under deleterious conditions. For financial reasons, they often don't want a transfer, even during pregnancy.

Employment of women under conditions that are deleterious to health inevitably leads to premature childbirth (birth weight less than 2.5 kg), the birth of children with congenital defects, and stillbirth. As we know, working and living conditions that are deleterious to health have an adverse effect on ova, enough of which are formed in the woman's body to last her lifetime and are not replenished or repaired. Moreover, it is known that the organs of the fetus are formed during the first trimester of pregnancy, i.e., during a period in which most pregnant women have not yet seen a doctor and generally have not told anyone about their condition. For that reason, even the most humane legislation could not provide for their transfer to another job. Consequently, the only solution is to protect women of fertile age against conditions deleterious to health, regardless of whether they are pregnant or not, and this must be done on as broad a scale as possible.

The next problem concerns preschool children. The Estonian Physicians' Union believes that, in addition to the need to improve medical supervision of youngsters, the parents, particularly mothers, must bear greater responsibility for the health and diet of the children and the necessary material and moral incentives for encouraging mothers to do this must be provided.

First of all, the allowance per child should be increased to 100 rubles per month, and the mother should be granted the opportunity to remain at home with the child for the first 3 years. That implies elimination of the system of day nurseries or their retention only in exceptional cases. As we know, the main psychological temperament of a child forms during the first 3 years, as do the child's immune system and a number of other physical and spiritual qualities essential to future life.

The present situation, in which children are away from their parents for most of the day in large day-nursery groups, where the law of "might is right" prevails, inevitably forms aggressiveness, impudence and rudeness in children, and it is difficult, and sometimes impossible, to eradicate these traits through upbringing in subsequent years. In addition to all the rest, day-nursery children are sick much more often than those raised at home. Since the body is not yet fully formed at that age, and treatment is often inadequate (the mother has to go to work), those diseases become the basis for subsequent chronic diseases. Thus, the new generation of mothers starts life burdened by diseases.

There must be a reduction in number of children in kindergarten groups and class size, just as there must be a reduction in size of the kindergartens and grade schools themselves. We have long since been convinced of the

adverse effect of large farms on the life and health of animals, but we stubbornly continue to build large kindergartens and grade schools in the name of illusory savings, but certainly to the detriment of children's health.

### Health Care and Other Areas of Life

For the sake of the health of mothers and children, we must speak out relentlessly against environmental pollution, particularly since the need for a general cleansing and improvement of the environment has, in most cases, been ignored in our republic even to the present day. The pursuit of profit by Union agencies and their stinginess have had the upper hand at a time when those agencies need to be concerned about people.

The struggle of the public against the working of phosphorite mines and the construction of new electric power plants that pollute the air is common knowledge. However, there are apparently many other widespread, environmentally detrimental factors that we are unaware of, since proper readings are not taken. Furthermore, the health service and the medical profession in general have virtually no right to voice their opinion on such matters. For example, to this day no one listens to the opinion of physicians as to what and where to build. The health service can impose only small fines in an effort to get others to adhere to GOSTs [All-Union State Standards]. There is no equipment to perform any sort of accurate measurements.

Rich departments that produce large amounts of pollution have created their own sanitary and epidemiological services, with staffs that receive wages and bonuses. That creates the illusion that everything possible is being done to protect the environment. **The time has come to establish a single, nondepartmental sanitary and epidemiological service subordinated to the Estonian Ministry of Health.** The republic's chief health officer should be approved for the position, just like a minister, by the Presidium of the Supreme Soviet and not by the Council of Ministers, which would make him independent of agencies. In addition, the health service should have the right to impose much more rigid sanctions, to the extent of closing an enterprise. Thus far, they have that right only on paper; in actuality, however, using obsolete technology, we are boldly advancing toward even greater pollution.

On the subject of the departmental approach to the individual, special mention should be made of the systems associated with health care, social security, education, exercise, and sports in light of the reorganization of the management system that is in progress. At the present time, it is primarily the above-mentioned departments who are involved with matters related to the health of the individual; however, there is no real, meaningful collaboration between them, with the exception of joint conferences held from time to time.

In order to form a social service that would focus, at least in the narrow sense of the word, on the individual, all of those departments should be united. The Estonian Physicians' Union has several arguments to support that perhaps unusual idea. Here are some of them: —Complete information and a unified approach to the health of the individual from birth to death are needed. —An individual cannot be divided among departments, depending on whether or not he is sick, temporarily disabled or an invalid, since all those states can alternate back and forth in his lifetime. —One of the most important periods in a person's life, from the standpoint of health—from birth to the age of 3—should be considered primarily the "domain" of medicine, not education. —Physical activity, an inseparable element of health (particularly in a growing body), cannot be employed merely to achieve the highest athletic skill, but should be used for the purpose of preserving and restoring an individual's health.

Thus, we believe it desirable for only one department to be concerned with an individual's health. It does not matter what you name it. At the present time, the Ministry of Health deals primarily with treatment of already existing diseases, whereas prevention merely gets a tip of the hat, since there are no effective moral and material incentives for a person to be concerned about his own health. Life has shown that the situation cannot be changed by constitutional declarations alone.

Social security addresses itself to a person when he has already lived the better part of his life or when he is disabled. Herein lie numerous human tragedies and misfortunes. Either an individual has not yet reached such a condition that social security is concerned with him, or else his condition is already too serious to matter. He is either too healthy or too sick for health care. Care, even terminal care, is still at an antediluvian level in our country. Problems involving care for the disabled have not yet been definitively solved either ethically or materially.

The activities of athletic societies and organizations are aimed primarily at higher athletic achievements, whereas health-improving athletics can be compared to a plant's consumer goods plan implemented primarily with production waste. In essence, there is just no interest in health-improving athletics, since the Sports Committee can barely manage to handle the schedule of competitions and the outfitting of the best athletes. As a former athlete, I am by no means underestimating the need and importance of higher athletic achievements as a component part of national culture; however, I believe that broad-based health-improving athletics and its organization and system must be integrated into health care.

In my opinion, athletics at the highest skill levels and involving the highest achievements should be the concern of sports societies and federations.



The present division of kids among departments is just as debatable. As long as kids are at home, they are treated by the public health service; but as soon as they enroll in a day nursery, they are under the care of the education system. We realize that it is very complicated to restructure the system of public education, and we are aware of the fact that its administrators will have their minds on matters other than day nurseries in the immediate future. The opinion has been formed that as long as teachers make every effort to replace a mother, father, a home environment during the day for 30-40 kids, everything is in order. But is it? Apparently, in spite of all our noble intentions, day nurseries will continue to exist until we can relieve mothers from work, by paying them an adequate allowance. But until that happens, we should at least have day nurseries systematically subordinated to pediatricians. They say that things were that way at one time, but without any particular benefit. But in those days our knowledge about children of nursery-school age was also much poorer than today.

Thus, in terms of organization, we need much more effective coordination in the form of a single department

	Importance to health (in %)	Risk factors
Life-style	49-53	Smoking, poor diet, harmful working conditions, poor economic and living conditions, substance and drug abuse in the family, lack of confidence, loneliness, low level of education and culture, high degree of urbanization
Human genetics, biology	18-22	Predisposition to hereditary and degenerative diseases
Environment, environmental conditions and climate	17-20	Air and water pollution by carcinogens; other types of air, water and soil pollution; dramatic change in properties of the atmosphere; intensification of heliocosmic, magnetic and other types of radiation
Health care	8-10	Inadequate preventive measures, poor and delayed medical care

Without going into a detailed analysis of the effects of risk factors, let me merely mention that the same factors can cause different diseases, while absence or reduction of such factors diminishes the risk of many diseases, depending on the specific features of the body.

As indicated at the 1987 conference in Helsinki, mortality due to cardiovascular diseases continues to rise sharply in some socialist countries. The same trend is demonstrable in Estonia. That means that the complex of government - medical profession - public is not efficient enough in the matter of protecting the health of the people, and that some of the basic principles of Soviet health care (national jurisdiction, prevention, public involvement in safeguarding health, etc.) have become deformed in our republic over the years. We need to create a climate in which specialists—physicians, psychologists, pedagogues—are authoritative, necessary consultants to the government and, for the public, serve as wise advocates of a healthy life-style.

concerned with and capable of implementing a unified policy for safeguarding and improving public health, with no way to dump its unfinished work on another department.

Human health is a phenomenon that is so multifaceted that corrections will be needed in the immediate or distant future in the structure of management of the republic, no matter how much departments may try to preserve their authority.

Let us now discuss the question of ensuring public health in terms of the interrelationship of the government, the medical profession, and the public. If any of these elements is idle, no results can be expected. That is confirmed by international experience and programs implemented in other countries which have resulted in a significant decline of mortality and morbidity in the last 10-15 years (Finland, United States, Switzerland and others), as reported at the conference of the International Epidemiological Association held in Helsinki, in 1987.

It is opportune to refer here to the factors on which health depends and to discuss those that affect it adversely (on the basis of USSR, U.S., and French sources for 1975-1986).

We shall now turn to some questions of health care organization in Estonia.

#### Personnel

Last year, 6,396 physicians were employed in the republic's health care network, i.e., 40.7 physicians per 10,000 population (if we include physicians working in other areas, there were 43.3 physicians per 10,000).

We have enough physicians (pertinent figures are higher only in Georgia and Latvia), and we have more of them than many capitalist countries, where there are 20-25 physicians per 10,000 population. However, the health of our people is by no means twice as good as in other countries. Consequently, our performance is not effective enough.

Last year, mid-level medical personnel numbered 14,337, or 91.3 per 10,000. Thus, there is approximately a 2.2:1 ratio of mid-level personnel to physicians.



According to international standards, a ratio of 8-10:1 is considered good, and that could be stretched to 4:1. Thus, we have a serious disproportion between physicians and mid-level medical personnel. We are faced with a dual distortion: too many physicians, and too few mid-level personnel. The disproportion arose as a result of the rigid All-Union regulations and the wage leveling in health care. The nursing profession ceased to be prestigious a long time ago. There are few groups at medical schools that teach in the Estonian language, and it is difficult to staff them. To this day, the Kokhtla-Yarve Medical School works with students from other Soviet republics who return to their homes upon graduating, i.e., it produces less personnel for this republic than it could.

The Estonian Physicians' Union and Estonian Nurses' Society believe it extremely necessary to elevate the social status of nurses; that their salaries should be on a par with at least the salaries of skilled industrial workers; and that the position of chief nurse of Estonian SSR should be introduced as a chief specialist. Only then will the medical schools be able to have the necessary student contingent, will the professional skills of nurses be improved, and will the relationship between physicians and nurses be normalized.

Apparently, this will become possible only after Estonian SSR changes to cost accounting, after it is rid of the petty guardianship of the USSR Ministry of Health, and after health care institutions are given the right to implement their own personnel and financial policies.

#### Hospital Bed-Space and Polyclinics

At the end of last year, there were 106 hospitals in Estonia with a total of 18,769 bed facilities, i.e., in round figures, there were 120 beds per 10,000 population. An average of 18 patients per year were treated (or examined) per bed-space. In all, somewhat more than one-fifth of the population was hospitalized, with slightly more rural patients than urban patients and each patient remaining in the hospital an average of 17 days. There were 11 outpatient visits per republic resident and less than one (0.8) house-call per year.

Medical care in hospitals is evolving rather unevenly. In the postwar years, many hospitals were located in converted buildings, which have since depreciated and some of which have been shut down. Up to the 1960s-1970s, availability of beds was relatively good, thanks to the existence of small hospitals. The first new hospitals were built only about 20 years ago. A number of central rayon hospitals has been erected in the past decade. When small schools were being eliminated, small hospitals that operated under poor conditions were also shut down.

At present, the situation is such that a modern level of central rayon hospitals is beginning to shape up; however, the small hospitals, which are unquestionably needed, have disappeared (in Finland they operate as

health centers). there is a marked shortage of beds, and the quality of hospitals in Tallinn and Tartu is particularly poor. At present, we have no modern district hospitals, and in general there is no effective system of rehabilitation therapy.

About half the existing hospitals need new buildings, since the appropriate quality of treatment more often than not cannot be attained by remodeling old buildings. In recent years, Finnish health care has moved in the direction of erecting new small hospitals, and it must be conceded that that is a people-oriented trend. While it is important to provide modern diagnostic services in centers, treatment can be administered in small local hospitals, where there is more of an opportunity to individualize it and make it more personal for the patient. In the future, we shall have to revise our policy in the area of hospital construction. It is necessary to include some sanatoriums in the republic's system of rehabilitation treatment.

The quality of health care is determined and will be determined in the future by the quality and accessibility of diagnostic tests—that is the key to its intensive development. The material prepared this year by the Estonian Ministry of Health that is being designated the program for development of this republic's health care for the period up to the year 2000 does not respond conceptually to that basic truth. It was prepared in accordance with views that are already obsolete.

The system of numerical indicators of health care institution performance needs to be changed. The work of those institutions should be evaluated on the basis of its difficulty and quality; accordingly, plans must be laid out for staff scheduling and a wage fund. The existing planning for staff load per bed encourages only a quantitative increase in activity. One should take the number of cured patients, with allowances made for the seriousness of their initial condition and for their response to therapy, as the basis for indicators reflecting hospital performance.

With the shortage of equipment at polyclinics and the uneconomical organization of their work, a large volume of tests has to be performed today at hospitals, although with normal outfitting they could be performed on an outpatient basis. The uneconomical organization of polyclinic work is largely attributable to existing legislation. Because patients and physicians are not trusted, the latter are compelled to spend an enormous amount of time on extending sick-leave certificates issued for too short a time, on participating in innumerable commissions, and on performing an enormous amount of bureaucratic scribbling.

#### Finances, Equipment and Drugs

For decades, the medical institutions of Soviet Estonia have been supplied in accordance with a notorious leftover principle. A total of 1.7-3.1 percent of the gross

national product is allocated for health care. In developed countries, that figure is 8-12 percent, and in absolute terms, one percent is considerably more significant than here. Our annual health care budget is about 120 million rubles, i.e., about 80 rubles per person. The actual need is 2-3 times higher.

The present shortage of funds in public health amounts to hundreds of millions of rubles, which cannot be covered all at once. Moreover, increasing the wage fund is not within the competence of the Estonian SSR, and there is virtually no manufacture of modern equipment and items for patient care in the country. At present, we are often unable to provide physicians, nurses and hospital attendants with the most elementary work tools. This inevitably damages worker morale and lowers work quality. Over the last 15 years, Estonian health care has never in as difficult a financial situation as it is in today.

The shortage of disposable blood and fluid transfusing systems, which is becoming the cause of serious complications and even death, is the most critical. Yet it turns out that it is more profitable for the plants that manufacture them to produce juice-makers!

Evidently, we in health care have also allowed ourselves to be lulled by the slogan that declares that everything is being for the good of man! The abyss between slogans and reality was exposed at the 19th CPSU Party Conference by Ye. Chazov, USSR minister of health. If, on that level, there remains only to lament on the sad fate of health care and appeal to departments for assistance, then it is indicative of the government's total disregard for the health of its citizens. During my visit to Cuba, I had the opportunity to see for myself that, in spite of the serious economic situation, the government keeps public education and health care on an appropriate level. We should follow that example! In particular, Estonian industry is capable of producing many types of diagnostic and therapeutic equipment.

The hope that some health care institutions could, considering present crowded conditions, start earning rubles or currency on their own harbors the danger that they will become like industrial and trade organizations and will move their basic purposes to the background.

#### Organization and Science

Today, the health care system is among the most stagnant and centralized. The petty guardianship and the dictates of the USSR Ministry of Health and its Health Care Organization Research Institute imeni N. A. Semashko still prevail over Union republic ministries of health and, through them, hospitals, too.

We must put a decisive end to that. The staffs of hospitals must be granted the same rights as granted by law to industrial worker groups of enterprises; we must completely entrust them with organizing their own work. In the crisis situation that has evolved, there should be a

sensible arrangement of direct contact between health care institutions and enterprises, and additional financing of hospitals (and polyclinics) by industry must be set up. We must decisively terminate financing based on strictly defined articles. Those problems must also be solved in the course of implementing cost accounting in the republic.

Introduction of the latest advances of medical science is still one of the sore points. In spite of the extensive research plans, science and practice are still developing separately. New methods are tested in practice only in accordance with the interests and needs of the scientific work. New methods often disappear along with loss of interest. In order to correct the situation, we should start financing not institutes and laboratories, but research programs. It would be desirable to establish innovative laboratories at major hospitals, so that health care itself could finance introduction of new concepts and methods and would not be entirely dependent on the interests of scientists. The research and educational work of practicing physicians should be financed on the same terms as the present remuneration for therapeutic work of instructors.

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Only the most important sore points in Estonian health care have been briefly outlined here. Unfortunately, there are others, and members of the Estonian Physicians' Union are discussing them competently and with concern. Based on an analysis of the present situation, the first conference of this republic's physicians, which convened in September, developed an outline of a potential program for the health care system within the context of republic-level cost accounting, as well as a platform for our physicians at the All-Union congress of physicians. In the light of the decisions of the 19th Party Conference, we must commence the cardinal restructuring of our republic's health care system. If we do not provide people with health, we render meaningless our other actions and aspirations.

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#### Job Description and Its Role in Certifying Internists

18400322 Moscow *KLINICHESKAYA MEDITSINA* in Russian Vol 66 No 12, Dec 88 (manuscript received 7 Jun 88) pp 121-122

[Article by M. V. Muravyev, Ye. Ch. Novikova and V. M. Pokidov, Central Order of Lenin Institute of Advanced Training of Physicians, Moscow: "Job Description and Its Role in Certification of Internists"]

[Text] In the context of radical restructuring and accelerated socioeconomic development of our country, a single-minded elevation of the skills of personnel is one

of the most important tasks. Certification of physicians is one measure that facilitates constant growth of professional skills, development of creative initiative of medical cadres, and the optimum placement and utilization of those cadres.

The level of training needed by a specialist is determined by the specialty requirements, which must be formulated in the job description, which is a description of the aggregate of knowledge, skills and sociopsychological traits of an individual that is necessary for work in a given specialty. Professional requirements are supplemented by official job requirements that are defined by the 23 September 1981 USSR Ministry of Health Order No 1000.

The development of requirements for specialists involved a number of difficulties that were due to the complexity of the list of health care institutions. According to the data in the "Collection of Standard and Model Staffs of Public Health Institutions," published in 1986 by the "Meditsina" Publishing House, the position of internist is specified for more than 26 types of treatment-and-prevention institutions. Moreover, most of those institutions have different management levels: district, rayon, municipal, oblast (or kray), republic, Union. Specialists have different skill levels and have different jobs (attending physician, department head, chief specialist). How can this complicated structure be tied in to development of professional and job requirements?

First of all, we referred to USSR Ministry of Health Order No 1280 and used the clauses in it that correlate professional job requirements and types of treatment-and-prevention institutions as a basis. As applied to internists, it concerns the following: internist (uncertified); specialist-internist; and specialist-internists of the second, first and highest qualification categories.

An internist who has not been certified is a physician on the district or rayon level with less than three years tenure as a physician. According to the 17 December 1981 USSR Ministry of Health Order No 1280, he must take a specialist-internist certification test three years after receiving his diploma (after working for two years as a district internist at a polyclinic or district hospital). This is what served as the basis for developing the job description of a specialist-internist and the job requirements for that specialist in order to certify him; we designed the certification on the basis of the unified structure approved by the 1 March 1979 Ministry of Higher and Secondary Specialized Education Order No 246 for graduates of higher educational institutions (as well as similar documents prepared in the Polish People's Republic, GDR, CzSSR and the Hungarian People's Republic).

Job descriptions for specialists in all fields, including internal medicine, were developed by a specially formed group of TsOLIUV [Central Order of Lenin Institute of Advance Training of Physicians] staff members (USSR

Ministry of Health Order No 1213, 20 November 1987), and TsOLIUV departmental staff. Those descriptions were submitted for evaluation to experts at institutes and on faculties for advanced training of physicians in our country, as well as in a number of research institutes, ministries of health of Union republics, and oblast health departments.

The job description of a specialist comprises the following sections: basic points; function of a specialist; conditions for acquiring a specialty; conditions for pursuing specialization; general requirements for a specialist; general knowledge; general skills; special knowledge and skills; manipulations in which the specialist must be proficient; list of mandatory literature. Being an official document, the job description indicates the professional function of a specialist and reflects the main requirements imposed on him from the standpoints of social development and personnel policies.

A job description may also be used to prepare curricula and programs for training internists, to plan as to need for them, and to organize their training in higher educational institutions and subsequent advanced training in the system of postgraduate medical education.

The function of a specialist and the conditions for acquiring a specialty and pursuing specialization are set forth in accordance with the 20 January 1982 USSR Ministry of Health Order No 44 and the Statute on the State System of Continuing Postgraduate Training of Supervisory Personnel and Specialists in Health Care, a draft of which was discussed at the All-Union Conference on Continuing Education, held in September 1987, in Moscow.

The requirements pertaining to personality traits are the same for all medical specialists.

The medical specialist must be trained for independent work and for performance of his basic functions: organizational, diagnostic, consultative, therapeutic, and preventive functions. He must have a combination of profound theoretical training and practical skills and a responsible attitude toward the job entrusted to him; he must be exacting toward himself and his subordinates and must constantly add to his professional competence and general cultural level, being constantly engaged in self-education. The internist must use in his practice the guidelines for scientific organization of labor. He must campaign for a healthy life-style and practice what he preaches. He must make good use of computer technology; he must be knowledgeable in modern scientific and technical information and be able to use it effectively to solve practical problems. He must display initiative and be principled and conscientiousness in his work. The internist must adhere strictly to the oath he has taken as a physician, be guided in all his actions by the principles of communist ethics, perform his civic duty, use the principles of medical ethics and deontology in his everyday work, and observe medical confidentiality.



The following constitute the basis of a job description: —Knowledge of traditional bases of Soviet health care and principles of organization of therapeutic care, including the universal health screening —Knowledge of the fundamentals of Soviet law, medical legislation, principles of medical ethics and deontology —Knowledge of the basic aspects of normal and pathological physiology; general and specific methods of research in therapy, and ability to interpret their results —Knowledge of symptomatology, diagnostics and differential diagnostics, prevention of the main internal diseases —Knowledge of general principles and methods of treatment, fundamentals of pharmacodynamics and pharmacokinetics of drugs, diet, as well as principles for rehabilitation of patients with internal pathology —Ability to render emergency care and to administer intensive care and resuscitation —Knowledge in expert certification of temporary and permanent disability

The skill requirements of an internist include the following sections: diseases of the cardiovascular, respiratory, digestive, urinary, and hemopoietic systems; rheumatic disease; infectious, occupational, and surgical diseases; emergency conditions in symptomatology of internal diseases; and internal diseases and their management in pregnant women. The list of manipulations in which an internist must be proficient is furnished in a special section. It deals primarily with resuscitation measures and actions in emergency cases.

It must be borne in mind that the professional requirements set forth in the job description merely represent the minimum level of professional competence of an internist and do not set any limits on professional growth.

In order to make an objective evaluation of the performance of an internist, it is necessary to develop qualification tests, the purpose of which is to assess conformity to professional and job requirements. Qualification tests, which include integral evaluation of knowledge, skills and abilities (qualification or certification test), must reflect both a qualitative and quantitative assessment. A qualitative evaluation of an internist's knowledge can be made by conversing with him and by observing his performance under appropriate conditions. A quantitative evaluation can be made only by means of a practical test, the results of which are submitted to quantitative statistical processing. We include well-known test methods in this evaluation. In a number of countries (United States, France, GDR, Poland, Czechoslovakia, Hungary, and others), qualification test banks have been formed that contain 1500 to 3000 test assignments consistent with the professional skill requirements imposed on internists in these countries. Such work has also been done in the USSR. Departments of internal medicine of institutes and faculties for advanced training of physicians are preparing a bank of questions and assignments consistent with job description, which permits objective determination of the level of professional skill of an internist and his adequacy for the job he holds.

At the present time, work is in progress to develop job descriptions that pertain to physicians in different fields who are of the second, first and highest categories. According to the 17 November 1981 USSR Ministry of Health Order No 1280, "Measures for Further Improvement of Certification of Physicians," the second qualification category is bestowed upon physicians with tenure in a given specialty of at least 5 years (at least 3 years for those practicing in rural areas). In our opinion, a second-category internist is a physician on the rayon level. What should distinguish him from a physician who has merely passed his specialist certification exam is a greater depth and breadth of knowledge and skills, as well as a large volume of work. With his skill level, he can successfully perform the duties of an internal medicine department head.

The first category of skills is bestowed upon physicians with tenure in their specialty of at least 7 years (at least 5 years for those in rural areas). This is physician on the municipal or oblast level who performs well the duties of a department head or chief specialist. His knowledge and skills are characterized by breadth and depth. In addition, a first-category internist performs the functions of a consultant. Training of personnel is also entrusted to him.

The highest skill category is bestowed upon a physician who has worked in his field at least 10 years (at least 7 years for rural physicians) and who has proven to be a qualified specialist capable of managing a large department on the city, oblast or republic level or of performing the duties of chief specialist, as well as implementing personnel training.

Use of the job description of an internist in the certification process will permit objective assessment of the level of his training, and this will be instrumental in improving the professional qualities of internists.

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### **Estimating Effectiveness of Mass Health Screening of the Public**

18400359 Moscow SOVETSKAYA MEDITSINA in Russian No 12, Dec 88 pp 51-53

[Article by M. N. Petrov, Internal Medicine Department No 1, First Leningrad Medical Institute imeni Academician I. P. Pavlov]

[Text] The main purpose of mass health screening is to improve the state of the public's health, which is characterized by the level of overall morbidity and morbidity with temporary disability. Despite the close connection between these indicators, there are significant differences between them. If morbidity with temporary disability is a function primarily of the incidence of acute illnesses or the exacerbation of chronic illnesses, overall

morbidity reflects the incidence of all illnesses.<sup>3</sup> In view of this, one may assume that, as far as mass health screening is concerned, these indicators reflect the effectiveness of its various stages.

The purpose of the work reported here was to compare the number of cases of illness and cases of temporary disability that were discovered over a 5-year period of screening of a population group in one of the urban polyclinics. The annual coverage of the screening fluctuated between 92 to 96 percent.

The overall morbidity (the number of cases of illness per 1,000 population) had a distinct tendency to increase with each subsequent year of mass health screening, exceeding the initial level after five years by 34.5 percent. Morbidity increased especially sharply in the first years of mass health screening, primarily because of first-time diagnoses of chronic diseases of the internal organs. The level and nosological structure of overall morbidity began to correspond to the results of comprehensive medical examinations when specialists were brought in.<sup>1,2,4</sup>

Morbidity due to chronic cholecystitis, gallstones, gastritis, hypertension, and chronic bronchitis increased especially substantially.

The main factors determining the dynamics of overall morbidity were the wider coverage of regular preventive examinations and the use in recent years of new and more informative diagnostic methods (bicycle ergometry, gastroscopy, ultrasound) during health screening.

Unlike chronic illnesses, which had a stable annual growth rate, morbidity due to acute illnesses (acute impairment of the cerebral blood circulation, myocardial infarction, pneumonia, etc.) did not change appreciably. Only morbidity due to chronic respiratory ailments, influenza, and acute tracheobronchitis fluctuated widely during these years, as a function of epidemiological circumstances. The overall morbidity due to acute infections of the upper respiratory tract did not change.

During the period in which the mass health screening was conducted, the dynamics of morbidity with temporary disability demonstrated a trend opposite that of overall morbidity, with the number of instances of temporary disability decreasing by 27.5 percent. The average duration and nosological structure of the causes for temporary disability changed to a lesser degree.

Acute respiratory infections were the main cause of temporary disability due to acute illnesses. Most of the remaining instances of temporary disability were caused by the exacerbation of chronic illnesses.

It is interesting to compare morbidity involving temporary disability with overall morbidity. The number of instances of temporary disability represented 36.1 percent of the total number of cases of illness registered.

Among chronic illnesses, the highest incidence of cases of temporary disability in relation to the number of cases of illness registered was noted in functional disorders of the nervous system and illnesses of the locomotor system. Temporary disability was especially frequent in arthritis patients. The number of arthritis patients unable to work was more than 1.5 times the number of patients with the same diagnosis who could work, which indicates repeated episodes of inability to work during the course of the year in connection with the exacerbation of arthritis. A high frequency of cases of temporary disability was also noted in osteochondrosis, the exacerbation of which was accompanied by annual losses to disability in every second patient.

The next most common contributor in terms of frequency of exacerbations with temporary disability consisted of chronic lung ailments and bronchial asthma (55.5 percent), with chronic bronchitis contributing somewhat less frequently (31.4 percent).

In cardiovascular diseases, every third patient was temporarily unable to work during the course of the year in connection with the exacerbation of the chronic process, especially the worsening of the course of hypertension (50.1 percent). Temporary disability due to the exacerbation of ischemic heart disease and cardiovascular lesions of the brain was considerably less frequent (17.5 and 18.9 percent, respectively).

The frequency of cases of temporary disability caused by the exacerbation of chronic illnesses of the gastrointestinal tract was lower than the most prevalent diseases we have indicated (16.2 percent). In chronic gastritis, exacerbations with temporary disability were only half as common. Exacerbations of chronic hepatitis, which was relatively rarely diagnosed, were accompanied by temporary disability every year in every third patient. At the same time, gallbladder diseases, which are among the most widespread diseases, resulted in temporary disability with only one-tenth of that frequency (4.6 percent).

Comparing overall morbidity and morbidity accompanied by temporary disability thus makes it possible to identify the relatively small set of diseases of the internal organs (hypertension, ischemic heart disease, chronic nonspecific lung diseases, gastritis, ulcers, and joint diseases) that are among the most widespread chronic illnesses distinguished by frequent exacerbations that result in temporary disability.

This is very important from a practical standpoint inasmuch as it makes it possible to conduct mass health screening more purposefully and to concentrate attention and resources on the primary and secondary prevention of those diseases.

When conducting mass health screening among a primarily working contingent or when there is a stable ratio of workers to nonworkers, comparing overall morbidity

and morbidity accompanied by temporary disability makes it possible to estimate the total effectiveness of different stages of mass health screening.

The level of overall morbidity is directly dependent on the effectiveness of the first stage of mass health screening—on the completeness and quality of the screening examination (the improvement of which results in an increase in the detectability of chronic illnesses). The incidence of cases of temporary disability is, to a large extent, a function of the exacerbation of chronic illnesses and reflects the effectiveness of the second stage of mass health screening—secondary prevention (measures to prevent recidivism and measures to prevent complications). The dependence of these indicators on the effectiveness of different stages of mass health screening is confirmed by the different directions taken by the dynamics of the indicators, which is manifested as a patterned increase in overall morbidity during the mass health screening process, with a simultaneous reduction in instances of temporary disability. In this context, the relationship between overall morbidity and morbidity accompanied by temporary disability becomes an integrated indicator characterizing the overall effectiveness of the first and second stages of mass health screening. This indicator acquires a high objectivity when chronic illnesses whose exacerbation most often leads to temporary disability are removed.

#### Conclusions

1. The overall morbidity level is directly dependent upon the effectiveness of the first stage of preventive health screening—on the completeness and quality of the screening examinations.
2. The dynamics of the frequency of instances of temporary disability characterize the effectiveness of, and are inversely proportional to, the second stage of mass health screening—the secondary prophylaxis of chronic illnesses.
3. When conducting mass health screening of a contingent of workers or when there is a stable ratio of workers to nonworkers, the relationship between overall morbidity and morbidity with temporary disability makes it possible to estimate the total effectiveness of the first and second stages of mass health screening. The informativeness of this indicator increases when chronic illnesses that most often become exacerbated are removed.

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UDC 616-082(47+57):008

#### Novel Forms of Medical Care for the Public

18400287a Moscow SOVETSKOYE

ZDRAVOOKHRANENIYE in Russian No 11, Nov 88  
(manuscript received 26 Jan 88) pp 35-38

[Article by V. F. Minakov, A. A. Kalininskaya, and M. N. Krasnova, All-Union Scientific Research Institute of Hygiene, Economics, and Health Care Management imeni N. A. Semashko, USSR Ministry of Health, Moscow]

[Abstract] Recent advances in medical care have emphasized the importance of home care and recovery, outpatient surgery, and other forms of health care that minimize confinement in a hospital or a clinic. Where applicable, this approach to medicine has found increasing acceptance in the West, and it has found acceptance in some regions of the USSR, e.g., Lvov, Odessa, Kuybyshev, Mogilev, Moscow, and Ivano-Frankovsk, to name a few of the more prominent locations. The emphasis is both on comprehensive care and on individual responsibility of the patient and his or her family when the patient requires hospitalization but not round-the-clock care. In general, patients are kept at these essentially outpatient facilities for 10-12 days, but may be discharged earlier for follow-up at home. Questionnaires addressed to some 300 patients managed in this manner showed a satisfaction rate of 99.8%. Assessment of the response of 115 physicians showed a similarly high degree of satisfaction with this approach to medical care. At the No 2 Polyclinic in Lvov, the average hospital stay under outpatient conditions has been reduced to 11.7 days, some 4.5 days fewer than the stay under conventional forms of hospitalization. What is even more remarkable is that up to 90% of such cases return to work immediately on discharge.

UDC 614.2(470.54-22)

#### Activities of Rayon Agromedical Teams

18400287b Moscow SOVETSKOYE

ZDRAVOOKHRANENIYE in Russian No 11, Nov 88  
(manuscript received 13 Jul 87) pp 38-41

[Article by V. P. Novoselov, Sverdlovsk Oblast Committee of the Trade Union Agroindustrial Complex Workers]

[Abstract] A three-year study was commenced in 1981 on the efficacy of rayon-level agromedical teams established in the Sverdlovsk Oblast at the Beloyarskiy,



Bogdanovichskiy, and Sysertskiy rayons. The teams were based on similar medical teams employed in the industrial sector. Each team consisted of 13 medical workers, with the primary objectives consisting of evaluation of the working conditions, general sanitary conditions on the state farms, and indication of corrective and preventive measures to be taken to preserve the health of farm workers. The positive effects of such surveillance were evident in the decrease in general morbidity, with the experience of the Belayarskiy rayon deserving special consideration—in 1981 the morbidity fell by 8.1%, in 1982 by 10.2%, and in 1983 by 7.8%. Because of the success of the first three teams, seven additional agromedical teams have already been established in the Sverdlovsk Oblast, bringing the total to ten, and 12 additional teams are expected to be activated before the end of the current Five Year Plan.

**State of Oncological, Radiological and X-ray Services for the Public and the Principal Guidelines for Improving It in Kazakhstan**  
18400290a Alma-Ata ZDRAVOOKHRANENIYE  
KAZAKHSTANA in Russian No 11, Nov 88 pp 1-8

[Article by T. A. Izmukhambetov, minister of health, Kazakh SSR]

[Abstract] Oncology and its related radiological services are of special importance in Kazakhstan in view of the fact that 17 percent of the mortality is due to cancer deaths. Although Kazakhstan ranks 8th among the Soviet republics in terms of cancer incidence, in terms of actual numbers Kazakhstan is third, right after the Russian SFSR and the Ukraine. Consequently, special efforts have been made in Kazakhstan to improve oncologic and radiological services, and, in the period 1980-1987, the number of hospital beds given over to oncologic patients has increased by 785 and now stands 3,460. Concerted efforts are also directed at mass screening and early detect, and educational campaigns are being organized to combat such predisposing factors as smoking. Kazakhstan now has more than 1,500 radiologists engaged in carrying out more than 10 million x-rays and over 120,000 nuclear medicine procedures. However, only 9-13 percent of these radiologists are highly skilled specialists. Some 32 percent of all gastric cancers are not diagnosed in a timely fashion as a result of the lack of special training among specialists. Much of the radiological equipment is out of date. Similar problems exist in radiotherapy, thus lowering the efficacy of what could otherwise be an important therapeutic modality. In general, despite considerable progress, much remains to be accomplished in implementing the latest advances in the practice of clinical oncology. Special attention shall have to be accorded to the elimination of risk factors, mass screening, and early diagnosis to reduce cancer morbidity by the target date of 2000.

**Outpatient Management of Children with Gastrointestinal Diseases**

18400290b Alma-Ata ZDRAVOOKHRANENIYE  
KAZAKHSTANA in Russian No 11, Nov 88 pp 21-23

[Article by A. Sh. Ismagilova, K. V. Alekseyenko, A. M. Ivanova, R. T. Sarymsakova, A. N. Merekesheva and L. N. An, Central Hospital, 4th Main Administration, Ministry of Health, Kazakh SSR; Chair of Hospital Pediatrics, Alma-Ata Medical Institute]

[Abstract] Summary details are presented on the advantages of an outpatient clinic for the management of children with gastrointestinal diseases, based on a 3-year evaluation of one such clinic. The key advantage of a specialized outpatient service of this type lies in the constant monitoring of the patient cohort by specialists. The children undergo quarterly comprehensive examinations and, twice a year, are seen by other specialists. The net effect of such concerted medical care is that 90 percent of the pediatric patients are judged to be rehabilitated: 5 percent are regarded as cured, 55 percent are in a state of stable remission, and 30 percent show significant improvement, but are continuing on therapy. Equally important is the fact that, in addition to management of clinical cases, such services are also instrumental in identifying risk factors and children at risk and consequently in strengthening the concept of pediatric preventive care.

UDC 613-036.865/866

**Morbidity With Temporary Disability: Status, Dynamics, Strategy and Near-Term Tasks**

18400304 Minsk ZDRAVOOKHRANENIYE  
BELORUSSII in Russian No 12, Dec 88 (manuscript received 11 May 88) pp 28-33

[Article by L. S. Gitkina, V. S. Ulashchik, and A. A. Zarin, BSSR Ministry of Health, Department of Medical and Occupational Expertise Belorussian Institute of Advanced Training for Physicians]

[Abstract] Over the 11th Five-Year Plan, morbidity with temporary disability was lowered in the BSSR by 8.7% (comparing well with the USSR-wide reduction of 2.7%); BSSR moved in this area from the 9th to the 4th place among other republics. In 1985 and 1986, however, primary disability rose. The causes for both phenomena are analyzed. The greatest reductions in temporary disability in the 11th and 12th Five-Year Plans were associated with infectious diseases of the skin; TB and nonspecific pulmonary diseases; diseases of the digestive organs, the peripheral nervous system, and the osteo-muscular system; trauma; hypertension; and rheumatism. The growth in primary disability was tied to diseases of the circulatory system, malignant tumors, and diseases of the eye and liver. Comprehensive analysis played a beneficial role in the management of morbidity with temporary disability. The authors stress that it must consist of region-by-region analysis of the medical care provided to the population and an analysis

of temporary disability on an industry-by-industry and a sector-by-sector basis. Figures 1; references: 3 (Russian).

UDC 616.348-006.6-07+616.348-006.6-08]:313.13

**Information of Colonic Cancer Derived from Moscow City Oncologic Outpatient Clinic**  
18400317a Moscow SOVETSKAYA MEDITSINA in Russian No 11, Nov 88 (manuscript received 27 Nov 87) pp 85-88

[Article by V. K. Orlov and G. Z. Khostikoyev, City Oncologic Outpatient Clinic, Moscow]

[Abstract] A statistical analysis was conducted on the incidence of colonic cancer in Moscow for the period 1982-1986, which showed an increase from 20.1 to 22.1/100,000 in that time frame. Analysis of age distribution revealed that 74.3 percent of the cases occurred in those in the 60-plus age bracket. Early diagnosis was made in only 15.2 percent of the cases, while 83.5 percent were already in stages III-IV of the disease at the time of diagnosis. Radical surgery was attempted in 49.8 percent of the cases, chemotherapy was employed in 1 percent of the patients, and radiotherapy in 0.6 percent. The incidence was almost twice as high in males than in females (36 percent women, 64 percent men). These observations point to the need for a greater index of suspicion on the part of primary physicians, particularly as the incidence of colonic cancer is expected to rise because of the aging population. References 3 (Russian).

UDC 616-006.6:362.147:681.325.22

**Results and Prospects for Automated Monitoring of Oncologic Patient Dispensary Services**  
18400354 Leningrad VOPROSY ONKOLOGII in Russian Vol 34 No 12, Dec 88 (manuscript received 2 May 87) pp 1433-1438

[Article by A. Ye. Okeanov, Scientific Research Institute of Oncology and Medical Radiology, Belorussian Public Health Ministry, Minsk]

[Abstract] One of the major goals in creating the system for monitoring dispensary services provided to oncologic patients was to automate a number of the functions performed by dispensary employees so as to release them for creative work and improve the organization of cancer treatment. The automated system performs automated monitoring of the timely examination and treatment of patients and calls them in for dispensary examination; monitoring of the timely discussion of causes for the late diagnosis of tumors; generation and administration of a database of all patients in treatment; generation of statistical materials to evaluate the effectiveness of preventive cancer screening of the population; generation of lists of newly registered patients to inform treatment organizations in the areas they serve; and generation of information to organize analysis of the status of cancer treatment efforts. A diagram of the information flow in

the system and a sample data input form for dispensary observation are presented. The system has been modified and improved over its 2-year period of experimental use. It has been effective in revealing weak points in the organization of patient examination, treatment, and accounting. Its use in the republic is expanding.

UDC 614.253.8-07

**System for Comprehensive Evaluation of Physician Competence**  
18400374a Moscow SOVETSKOYE ZDRAVOOKHRANENIYE in Russian No 12, Dec 88 pp 3-9

[Article by E. S. Gabrielyan, A. P. Oganessian and Yu. A. Mnatsakanyan, Armenian SSR Ministry of Health]

[Abstract] A comprehensive method had been developed for physician rating. It utilizes answers provided by patients and tests claims to knowledge via a certification program. The questionnaires presented to the patients employ a standardized format allowing for the evaluation of a number of parameters, each subject to a rating scale ranging from "completely unsatisfactory," to "unsatisfactory," "partially satisfactory," to "satisfactory." The information provided by the patients is collated and processed by computer, in conjunction with a medical certification program. The latter consists of computer-based testing of clinical competence using a dialogue format, designed to take into account specialty, medical experience, postgraduate training, etc. This approach to evaluation of clinical competence is currently being implemented in the Armenian SSR and may well become one of the cornerstones of perestroika in Soviet health care.

UDC 616-082-039.57:616-082.4:344"

**Role of Day Hospital in Improving the Quality of Polyclinic Care**  
18400374b Moscow SOVETSKOYE ZDRAVOOKHRANENIYE in Russian No 12, Dec 88 (manuscript received 16 Mar 88) pp 15-17

[Article by A. A. Kalininskaya, V. N. Polatayko, O. F. Liman and I. A. Vishnyakova, All-Union Scientific Research Institute of Social Hygiene, Economics and Health Care Management imeni N. A. Semashko, USSR Ministry of Health, Moscow]

[Abstract] An analysis was conducted on the public perception and actual clinical accomplishments of an ambulatory hospital service established in 1985 at the No 2 Polyclinic in Lvov, Western Ukraine. The service was designed to cover therapeutic and neurological patients, with questionnaire responses by the patients showing a very high degree of satisfaction (96.7 percent are satisfied with the manner in which the service is administered, and 99.7 percent recognize ambulatory health care as a positive modality that should be

expanded). Evaluation of patient statistics revealed that 54.5 percent of the cases covered at the service dealt with cardiovascular problems, 22.6 percent with gastrointestinal disorders, 10.1 percent with neurology, 1.5 percent with diabetes mellitus, and 2.8 percent were represented by other medical problems. The usual stay at the service ranged from 9 to 14 days, and the mean duration of sick leave was 11.7 days, representing a figure that is 4.5 days shorter than the usual length of sick leave involving hospitalization. On balance, the study demonstrated that ambulatory health services represent an efficient and acceptable method of health care delivery.

UDC 613.89:392.3+613.95

**Medical and Demographic Assessment of Large, Young Families in Kazakhstan**

18400374c Moscow SOVETSKOYE

ZDRAVOOKHRANENIYE in Russian No 12, Dec 88

(manuscript received 18 Sep 87) pp 29-33

[Article by P. P. Petrov, doctor of medical sciences, and G. P. Kasymova, Scientific Research Institute of Regional Pathology, USSR Ministry of Health, Alma-Ata]

[Abstract] An analysis was conducted on rural families in Kazakhstan in 1984-1985 in order to assess trends in family size vis-a-vis economic development and national characteristics. For purposes of this study, large, young families were defined as those representing a first marriage, with 3 or more children and parental ages of 29 years or less. Study of a cohort of 100 families established that 67 percent of the families had 3 children, 22 percent had 4 children, 9 percent had 5 children, and 2 percent had 6 children. In addition, 50 percent of the target families had a grandfather or a grandmother living with them, and 82 percent of the fathers and 80 percent of the mothers themselves came from large families. Various forms of contraception were practiced by 34 percent of the parents, denoting a recently developing trend toward family planning among Kazakhs in conjunction with social advancement and a trend toward working mothers. These findings provide further confirmation for a pattern toward a lower birth rate in Kazakhstan over the period 1960 to 1985; from 41.7 to 27.5/1000 in the rural population, and from 31.6 to 22.2/1000 in the urban population. Figures 1; references 14 (Russian).



UDC 616.89-008.442.36-053

**Age Dynamics and Conditions of Formation of Male Homosexuality**

18400307b Moscow *ZHURNAL NEVROPATOLOGII I PSIKHIATRII IMENI S. S. KORSAKOVA* in Russian Vol 88 No 12, Dec 88 (manuscript received 29 Sep 87) pp 78-82

[Article by A. K. Kachayev and G. N. Ponomarev, All-Union Scientific Research Institute of General and Forensic Psychiatry imeni V. P. Serbskiy, USSR Ministry of Public Health, Moscow]

[Abstract] A study of male homosexuality involved 240 patients aged 18-50; in terms of nature of sexual contact, 150 were deemed "active" homosexuals, and 90, "passive" homosexuals. Sexual, psychosexual, somato-sexual, and intellectual-personality development were studied. Based on the results obtained, an attempt was made to develop an adequate method of treatment of homosexuals. Forty patients were hospitalized for treatment, the most effective form of which was a 12-day course of general reinforcing treatment involving somatic status, plus a monthlong course of Aminazine, which caused homosexual tendencies to disappear, plus an increase in the physiological factors natural for males experiencing sexual abstinence. This was followed by a decrease in Aminazine dose and a course of i.m. administered Sulfazin (one percent mixture of purified sulfur in olive oil), the dose of which was gradually increased; frequency of administration varied with body temperature and tolerance. Significant therapeutic effect was observed in all cases. Continued maintenance treatment with Trioxazine, Neuleptil and psychotherapy resulted in complete disappearance of homosexuality in all cases,

though there was some recidivism in the long term. A permanent solution to the problem of preventing homosexuality will require that homosexuals be identified and registered in mental-health dispensaries and by the police and that active psychiatric screening be provided, in part in order to determine persons with particularly persistent perversion, manifested as commission of crimes, particularly against children, with the possibility of mandatory treatment with confinement in a psychiatric hospital. References 21: 18 Russian, 2 Western.

**Activation of Human Factor and Some Trends in Development of Soviet Psychophysics**

18400361 Moscow *PSIKHOLOGICHESKIY ZHURNAL* in Russian Vol 9 No 6 Nov-Dec 88 pp 32-41

[Article by K. V. Bardin and Ye. Z. Frishman, Institute of Psychology, USSR Academy of Sciences, Moscow]

[Abstract] The range of problems that can be studied by psychophysics is noted, as are the main paths of their implementation. The problem is formulated as follows: What specific measures can modern psychophysics suggest to activate the human factor? This is discussed in two aspects: main trends of contemporary psychophysics and the contribution that can be made to activate the human factor. A new trend in psychophysics is suggested whereby the observer becomes an active subject of psychophysical measurement. This is the key to increasing the significance of the human factor in psychophysics. The reorganization of sensory space and differential psychophysics are analyzed. The research discussed in this article allows the traditional psychophysical paradigms to be overturned and uses the observer as an active subject in psychophysical research. References 34: 29 Russian, 5 Western.

UDC 615.849.1/.2.015.25(035) (049.32)

**G. A. Zedgenidze Reviews Book on Radioprotectors**

18610297 Moscow MEDITSINSKAYA RADIOLOGIYA in Russian Vol 33 No 11, Nov 88 pp 77-78

[Review by Academician G. A. Zedgenidze, USSR Academy of Medical Sciences, of "Radioprotektory (spravochnik)" [Radioprotectors (A Reference Book)], by V. S. Gugushvili, I. M. Dzhandzhgava, Z. D. Kakhiani, K. Sh. Nadareyshvili, O. N. Sanbladze, and M. N. Khurtsiya, Tbilisi: Metsniyereba, 1987, 472 pages]

[Text] This 472-page reference book is devoted to a very important problem—protecting living organisms against radiation. The book contains materials published in the USSR and abroad between 1965 and 1985 that deal with the study of pharmacochemical agents increasing the organism's radiation resistance. As the authors rightly stress in their foreword, similar domestic and foreign publications were published during the sixties, and the data presented in the book being reviewed here are thus distinguished by their innovation, reflecting the current status of the problem. That is true especially since it includes information dealing with the mechanism of action of the most-studied drugs and chemical compounds. It can therefore be boldly stated that this edition of the book being reviewed is unique.

Besides a foreword, the reference book contains three independent sections, a bibliography, a list of abbreviations, and a subject index. The independent sections deal with the following: medications to prevent radiation injuries (276 pages), the combined use of agents for preventing radiation injuries (71 pages), and the clinical use of certain antiradiation protective agents (8 pages).

All of the sections are laid out in the same manner. The text is presented in two columns. The left-hand column contains the drug or chemical name, dose, time and method of administration, and type and dose of radiation. The right-hand column contains the object under investigation, the characteristics of the effectiveness of radiation protection, and a bibliographic source citation.

This method of presenting the material is very convenient for a reader who is searching for needed sources within an extensive amount of information about radioprotectors. As the authors note, the reference book does not contain any information about research on physical means and methods of protecting against radiation (aeroionization, electromagnetic fields with different frequency ranges, etc.). The mechanisms of their effect are unclear, and their results are debatable.

The bibliography and, consequently, all the published works amount to almost 1,500 sources, which in and of itself confirms the abundance of information and the

difficulties in getting oriented in it without an appropriate reference book. The well compiled subject index, which is 15 pages long, provides the necessary help in finding needed information.

The authors have thus collected and systematized the enormous amount of material on pharmacochemical radioprotectors that has been published both in our country and abroad, which undoubtedly required a great deal of effort, painstaking labor, and skill. The book is a valuable reference aid for radiobiologists and radiologists, hygienists and radiation therapists, a wide range of physicians, and research associates interested in matters related to radiation protection.

The materials presented in this reference book will make it possible to avoid superfluous searches and to efficiently plan scientific research work in this area of practical import.

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**Evaluation of Internal Radioactivity in Man Due to Radionuclide Inhalation**

18400392 Moscow GIGIYENA I SANITARIYA, in Russian No 11, Nov 88 (manuscript received 15 Dec 87) pp 90-91

[Article by L. M. Shcherbakova: "Evaluation of Internal Radioactivity in Man Due to Inhalation of Radionuclides"]

[Text] Evaluation of the expected levels of irradiation of personnel and the public is one of the principal tasks put to radiation hygiene.<sup>4</sup> The question of estimating the internal radiation dosage is particularly acute. Aside from the shortage of information about the parameters needed for such estimates, there is still no standardized approach to calculating doses when parameters are known. Some authors estimate only the annual dose from chronic<sup>3</sup> intake per year, others estimate the dose expected after 70 years from a 1-year intake,<sup>5</sup> while still others estimate the cumulative dose from chronic intake for many years.<sup>11</sup> Sometimes, the annual dose is included in estimates of biological effects. In other cases, a comparison to PD [absorbed or tolerated dose?] and the maximum permissible dose [PDD] is made on the basis of the dosage accumulated from 1 year of intake.<sup>3</sup> However, the concept of annual dose is tantamount to the dose rate, for which the NRB-76 [Radiation Safety Standard] sets a standard for the 50th and 70th years of chronic intake in the case of nuclides that do not attain equilibrium in man. Moreover, the oncogenic effect per unit dose in the case of a chronic intake of beta and gamma nuclides, as established in animal experiments, is lower than the effect of a one-time intake with commensurate dose rate levels.<sup>2</sup> In recent years, manuals have been published abroad<sup>7</sup> that deal with monitoring radioactivity in which it is recommended that a determination

be made of the expected lifetime dose from 1 year of nuclide intake in order to assess the situation on the basis of the factor of internal radioactivity. It is implied that biological effects will be evaluated according to the arithmetic sum of "annual doses" thus obtained. Our estimates revealed that the cumulative dose calculated for 50 and 70 years as the sum of "annual doses" would equal the cumulative dose estimated for chronic nuclide intake. However, formation of the expected dose rate in the case of chronic intake is uniform for nuclides that reach equilibrium in organs in the first year of intake, whereas for those that do not reach equilibrium in the first year of intake (for example  $^{239}\text{Pu}$ ) it changes by tens of times in the first 30 years of intake and by approximately 2 times after the 30th year of intake. Cumulative doses change even more.

For this reason, our objective here was to assess the dynamics of changes as a function of time in load, dose rate, and cumulative dose from the chronic intake of radionuclides that are radiologically the most significant.

We took the baseline formulas and parameters needed to estimate the load and dosage from the 1973 lung model of the International Commission for Radiological Safety,<sup>6,8</sup> but considered 0.45<sup>9</sup> to be the share of transition from blood into critical organs for  $^{238}\text{Pu}$  and  $^{239}\text{Pu}$ .

Estimates were made for the poorest conditions from a hygiene point of view: intake of class Y (stationary) compounds in the lungs and class D (labile) compounds in bone, liver, and the body in accordance with the lung model.

Data on weight were considered to be as follows: lungs,  $10^3$  g; bone,  $7 \times 10^3$  g; liver,  $1.7 \times 10^3$  g; and body,  $7 \times 10^3$  g.

For hygienic estimates, the baseline formulas were reduced to simple equations:

$$Q = T_Q \times I \quad (1)$$

$$P = T_P \times I \quad (2)$$

$$D = T_D \times I \quad (3)$$

where Q, P, and D refer to nuclide level (Bq), dose rate (mSv/year) and cumulative dose (mSv), respectively, in the organ in the *n*th year of intake;  $T_Q$ ,  $T_P$ , and  $T_D$  refer to standardized coefficients for the transition from the intensity of intake to the level [Bq/(Bqday<sup>-1</sup>)], dose rate [mSv/year<sup>-1</sup>/(Bqday<sup>-1</sup>)], and cumulative dose [mSv/(Bqday<sup>-1</sup>)], respectively; I is intensity of intake (Bqday<sup>-1</sup>).

The estimated  $T_Q$ ,  $T_P$ , and  $T_D$  are listed in the table.

Levels, dose rates and cumulative doses as a function of duration of chronic inhalation of radionuclide mixture (1 Bq/day for 365 days/year)

Radionuclide	Exposure time, years	Level (load) $T_Q$ , Bq			Dose rate $T_P$ , mSv/year			Cumulative dose $T_D$ , mSv		
		lungs	bone	liver	lungs	bone	liver	lungs	bone	liver
$^{239}\text{Pu}$	1	$4.3 \times 10^1$	$7.4 \times 10^1$	$7.4 \times 10^1$	$2.3 \times 10^1$	$2.8 \times 10^1$	$2.4 \times 10^1$	$1.2 \times 10^1$	$1.5 \times 10^1$	$10.9 \times 10^0$
	30	$1.1 \times 10^2$	$2.1 \times 10^3$	$1.9 \times 10^3$	$5.8 \times 10^1$	$8.1 \times 10^2$	$5.9 \times 10^2$	$1.6 \times 10^3$	$1.2 \times 10^4$	$8.6 \times 10^3$
	50	$1.1 \times 10^2$	$3.4 \times 10^3$	$3.0 \times 10^3$	$5.8 \times 10^1$	$1.2 \times 10^3$	$9.5 \times 10^2$	$2.8 \times 10^3$	$3.4 \times 10^4$	$2.5 \times 10^4$
	70	$1.1 \times 10^2$	$4.6 \times 10^3$	$3.9 \times 10^3$	$5.8 \times 10^1$	$1.8 \times 10^3$	$1.2 \times 10^3$	$3.9 \times 10^3$	$6.5 \times 10^4$	$4.7 \times 10^4$
$^{241}\text{Am}$	1	$4.3 \times 10^1$	$4.0 \times 10^1$	$4.0 \times 10^1$	$2.5 \times 10^1$	$1.7 \times 10^1$	$1.3 \times 10^1$	$1.4 \times 10^1$	$8.2 \times 10^0$	$7.4 \times 10^0$
	30	$1.1 \times 10^2$	$1.1 \times 10^3$	$6.9 \times 10^2$	$6.3 \times 10^1$	$4.6 \times 10^2$	$2.4 \times 10^2$	$1.7 \times 10^3$	$7.1 \times 10^3$	$4.7 \times 10^3$
	50	$1.1 \times 10^2$	$1.8 \times 10^3$	$7.5 \times 10^2$	$6.3 \times 10^1$	$7.3 \times 10^2$	$2.6 \times 10^2$	$3.0 \times 10^3$	$1.9 \times 10^4$	$9.6 \times 10^3$
	70	$1.1 \times 10^2$	$2.5 \times 10^3$	$7.7 \times 10^2$	$6.3 \times 10^1$	$10.0 \times 10^2$	$2.6 \times 10^2$	$4.2 \times 10^3$	$3.5 \times 10^4$	$1.5 \times 10^4$
$^{238}\text{Pu}$	1	$4.3 \times 10^1$	$8.2 \times 10^1$	$8.2 \times 10^1$	$2.5 \times 10^1$	$3.4 \times 10^1$	$2.8 \times 10^1$	$1.3 \times 10^1$	$1.7 \times 10^1$	$1.3 \times 10^1$
	30	$1.1 \times 10^2$	$1.9 \times 10^3$	$1.6 \times 10^3$	$6.1 \times 10^1$	$7.6 \times 10^2$	$6.0 \times 10^2$	$1.7 \times 10^3$	$1.2 \times 10^4$	$10.0 \times 10^3$
	50	$1.1 \times 10^2$	$2.7 \times 10^3$	$2.5 \times 10^3$	$6.1 \times 10^1$	$10.9 \times 10^2$	$8.2 \times 10^2$	$2.9 \times 10^3$	$3.1 \times 10^4$	$2.5 \times 10^4$
	70	$1.1 \times 10^2$	$3.2 \times 10^3$	$2.8 \times 10^3$	$6.1 \times 10^1$	$1.3 \times 10^3$	$9.6 \times 10^2$	$4.2 \times 10^3$	$5.5 \times 10^4$	$4.3 \times 10^4$
$^{242}\text{Cm}$	1	$2.3 \times 10^1$	$1.5 \times 10^1$	$2.0 \times 10^1$	$1.5 \times 10^1$	$8.7 \times 10^0$	$9.1 \times 10^0$	$9.9 \times 10^0$	$6.3 \times 10^0$	$6.6 \times 10^0$
	50	$2.7 \times 10^1$	$1.6 \times 10^1$	$2.0 \times 10^1$	$1.7 \times 10^1$	$9.1 \times 10^0$	$9.5 \times 10^0$	$8.5 \times 10^2$	$4.5 \times 10^2$	$4.7 \times 10^2$
	70	$2.7 \times 10^1$	$1.6 \times 10^1$	$2.0 \times 10^1$	$1.7 \times 10^1$	$9.1 \times 10^0$	$9.5 \times 10^0$	$1.2 \times 10^3$	$6.3 \times 10^2$	$6.6 \times 10^2$
$^{90}\text{Sr}$	1	$4.2 \times 10^1$	$4.8 \times 10^1$	—	$2.3 \times 10^{-1}$	$1.9 \times 10^{-1}$	—	$4.1 \times 10^{-1}$	$9.6 \times 10^{-1}$	—
	5	$9.4 \times 10^1$	$2.2 \times 10^2$	—	$5.2 \times 10^{-1}$	$8.7 \times 10^{-1}$	—	$2.4 \times 10^0$	$2.3 \times 10^0$	—
	30	$1.0 \times 10^2$	$8.7 \times 10^2$	—	$5.5 \times 10^{-1}$	$3.4 \times 10^0$	—	$1.6 \times 10^1$	$6.1 \times 10^1$	—
	70	$1.0 \times 10^2$	$1.2 \times 10^3$	—	$5.5 \times 10^{-1}$	$4.7 \times 10^0$	—	$3.8 \times 10^1$	$2.3 \times 10^2$	—
$^{137}\text{Cs}$	1	$4.2 \times 10^1$	$7.2 \times 10^1$	—	$8.6 \times 10^{-2}$	$3.2 \times 10^{-3}$	—	$1.5 \times 10^{-1}$	$1.9 \times 10^{-3}$	—



Levels, dose rates and cumulative doses as a function of duration of chronic inhalation of radionuclide mixture  
(1 Bq/day for 365 days/year)

Radionuclide	Exposure time, years	Level (load) $T_Q$ , Bq			Dose rate $T_P$ , mSv/year			Cumulative dose $T_D$ , mSv		
		lungs	bone	liver	lungs	bone	liver	lungs	bone	liver
	5	$9.4 \times 10$	$9.0 \times 10$	—	$1.9 \times 10^{-1}$	$3.8 \times 10^{-3}$	—	$9.2 \times 10^{-1}$	$1.7 \times 10^{-2}$	—
	30	$1.0 \times 10^2$	$9.0 \times 10$	—	$2.0 \times 10^{-1}$	$3.8 \times 10^{-3}$	—	$5.9 \times 10^0$	$1.1 \times 10^{-1}$	—
	70	$1.0 \times 10^2$	$9.0 \times 10$	—	$2.0 \times 10^{-1}$	$3.8 \times 10^{-3}$	—	$1.4 \times 10$	$2.7 \times 10^{-1}$	—
$^{106}\text{Ru}$	1	$3.2 \times 10$	$7.8 \times 10^{-1}$	—	$2.2 \times 10^{-1}$	$3.6 \times 10^{-3}$	—	$2.6 \times 10^{-1}$	$3.1 \times 10^{-3}$	—
	5	$4.5 \times 10$	$7.8 \times 10^{-1}$	—	$3.2 \times 10^{-1}$	$3.6 \times 10^{-3}$	—	$1.5 \times 10^0$	$1.8 \times 10^{-2}$	—
	30	$4.6 \times 10$	$7.8 \times 10^{-1}$	—	$3.2 \times 10^{-1}$	$3.6 \times 10^{-3}$	—	$9.5 \times 10^0$	$1.1 \times 10^{-1}$	—
	70	$4.6 \times 10$	$7.8 \times 10^{-1}$	—	$3.2 \times 10^{-1}$	$3.6 \times 10^{-3}$	—	$2.2 \times 10$	$2.5 \times 10^{-1}$	—
$^{144}\text{Ce}$	1	$3.0 \times 10$	$3.1 \times 10$	$2.0 \times 10$	$1.9 \times 10^{-1}$	$1.4 \times 10^{-1}$	$7.7 \times 10^{-2}$	$2.1 \times 10^{-1}$	$8.1 \times 10^{-2}$	$4.8 \times 10^{-2}$
	5	$4.0 \times 10$	$4.8 \times 10$	$4.8 \times 10$	$2.6 \times 10^{-1}$	$2.2 \times 10^{-2}$	$9.2 \times 10^{-2}$	$1.2 \times 10^0$	$8.6 \times 10^{-1}$	$4.0 \times 10^{-1}$
	30	$4.0 \times 10$	$4.8 \times 10$	$4.8 \times 10$	$2.6 \times 10^{-1}$	$2.2 \times 10^{-1}$	$9.2 \times 10^{-2}$	$7.8 \times 10^0$	$6.3 \times 10^0$	$2.7 \times 10^0$
	70	$4.0 \times 10$	$4.8 \times 10$	$4.8 \times 10$	$2.6 \times 10^{-1}$	$2.2 \times 10^{-1}$	$9.2 \times 10^{-2}$	$1.8 \times 10$	$1.5 \times 10$	$6.4 \times 10^0$
$^{95}\text{Zr}$	1	$1.2 \times 10$	$1.4 \times 10$	$2.4 \times 10$	$3.1 \times 10^{-2}$	$1.1 \times 10^{-2}$	$4.1 \times 10^{-3}$	$3.0 \times 10^{-2}$	$8.1 \times 10^{-3}$	$3.0 \times 10^{-3}$
	5	$1.2 \times 10$	$1.4 \times 10$	$2.4 \times 10$	$3.1 \times 10^{-2}$	$1.1 \times 10^{-2}$	$4.1 \times 10^{-3}$	$1.6 \times 10^{-1}$	$5.3 \times 10^{-2}$	$1.9 \times 10^{-2}$
	30	$1.2 \times 10$	$1.4 \times 10$	$2.4 \times 10$	$3.1 \times 10^{-2}$	$1.1 \times 10^{-2}$	$4.1 \times 10^{-3}$	$9.7 \times 10^{-1}$	$3.3 \times 10^{-1}$	$1.2 \times 10^{-1}$
	70	$1.2 \times 10$	$1.4 \times 10$	$1.4 \times 10$	$3.2 \times 10^{-2}$	$1.1 \times 10^{-2}$	$4.1 \times 10^{-3}$	$2.2 \times 10^0$	$7.7 \times 10^{-1}$	$2.9 \times 10^{-1}$

Note: Figures for  $^{137}\text{Cs}$  were estimated for the body instead of bone.

Here is an example to illustrate the use of the tabulated data. Let us assume that the concentration of labile  $^{239}\text{Pu}$  compounds equals  $DK_A 0.033 \text{ Bq/m}^3$ . In the absence of a respirator and with inhalation of  $10 \text{ m}^3/\text{day}$  air per work day, the intensity of intake will be  $0.33 \text{ Bq/day}$ . With such an intensity of chronic intake and considering that there are 280 work days per year ( $365 \times 0.77 = 280$ ), the sought values for bone, estimated by using formulas (1)-(3), in the 50th year will be as follows: level,  $750 \text{ Bq}$  ( $DC_A$  [permissible concentration] =  $740 \text{ Bq}$ ); dose rate,  $0.275 \text{ mSv/year}$  (maximum permissible dose rate =  $300 \text{ mSv/year}$ ); cumulative dose,  $750 \text{ mSv/50 years}$ .

Let us note that under real working conditions the sought figures per unit concentration can only diminish with the use of protective gear and the presence of different classes of compounds.

Thus, the coefficients obtained are suitable for a dynamic estimation of the maximum possible nuclide levels, dose rates, and cumulative doses in the principal organs of their deposition.

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UDC 577.391.591.111

**Experimental and Theoretical Assessment of Lymphopoiesis Dynamics in Prolonged Irradiation**  
18400332a Moscow RADIOBIOLOGIYA in Russian  
Vol 28 No 5, Sep-Oct 88 (manuscript received 29 Dec 87) pp 626-631

[Article by T. M. Zukhbaya and O. A. Smirnova, Institute of Biomedical Problems, USSR Ministry of Health, Moscow]

[Abstract] Outbred female rats were subjected to prolonged irradiation (22 h/day gamma-irradiation from Cs-137 source, 0.1-4.0 Gy/d) to provide experimental data for comparison with the results of a theoretical analysis. The mathematical model relied on nine nonlinear differential equations reflecting the status of bone marrow cells ranging from stem cells to differentiated lymphoblasts, nondividing mature bone marrow lymphocytes, and mature lymphocytes in the blood. On the basis of susceptibility to irradiation, they were divided into the following categories for purposes of analysis: undamaged cells, cells dying within 1-2 days, and seriously injured cells dying within 4-6 h. Comparison of both sets of data, taking into consideration a chalone mechanism for regulation of lymphopoiesis, yielded excellent agreement. The latter fact serving to confirm the importance of chalones in regulation of lymphopoiesis, as well as of the mathematical approach taken to monitor lymphocyte dynamics. The demonstration that bone marrow lymphocyte content increases as a result of prolonged irradiation may be used for predicting perturbations in lymphopoiesis in prolonged irradiation. Figures 3; references 16: 14 Russian, 2 Western.

UDC 577.391.621.386.86

**Radioprotective Efficacy, Toxicity, and Mechanism of Action of Bis-(Beta-Dimethyloctylammoniummethyl) Disulfide**  
18400332b Moscow RADIOBIOLOGIYA in Russian  
Vol 28 No 5, Sep-Oct 88 (manuscript received 1 Feb 88) pp 686-690

[Article by V. G. Vladimirov, Yu. Ye. Strel'nikov, N. I. Libikova, I. I. Krasilnikov and A. V. Kokushkina, Military Medical Academy imeni M. S. Kirov, Leningrad]

[Abstract] Comprehensive studies were conducted on the radioprotective efficacy, toxicity, and mechanism of action of bis(beta-dimethyloctylammoniummethyl) disulfide (I), employing mice, rats, and dogs. In mice, intraperitoneal administration of I increased the 30-day survival rate from 4 percent after 7.5 Gy gamma-irradiation to 55 percent with 6 mg/kg I and to 1 and to 60 percent with 8 mg/kg I. However, the LD<sub>50</sub> for I was 14 mg/kg. The compound I was nontoxic on intragastric administration, but also lacked radioprotective efficacy

when administered by this route. By comparison, equivalent degrees of protection with cystamine and N,N'-tetramethylcystamine required doses of 120-140 mg/kg. Biochemical analysis for the mechanism of action of I and its analogs demonstrated that radioprotectiveness was attributable to a slow-down in cell division of susceptible tissues, as evidenced by inhibition of DNA synthesis. Concomitant metabolic alterations included depression of oxidative processes leading to uncompensated acidosis. A number of sulfur compounds (Na<sub>2</sub>SO<sub>3</sub>d, cystamine, unithiol) were seen to diminish to toxicity of I, suggesting their potential use as antidotes for I. However, the combined use of I and cystamine is precluded since the latter diminishes the radioprotective effectiveness of I. Figures 1; references 12: 10 Russian, 2 Western.

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**Radioprotective Efficacy of Copper, Cobalt, and Zinc Complexes with Substituted Acylhydrazones**  
18400332c Moscow RADIOBIOLOGIYA in Russian  
Vol 28 No 5, Sep-Oct 88 (manuscript received 29 Dec 87) pp 691-694

[Article by O. V. Arapov, L. S. Arestova, O. F. Alferova, I. I. Krasilnikov and L. A. Khorseyeva, Military Medical Academy imeni S. M. Kirov, Leningrad]

[Abstract] Tabulated data are presented on trials conducted on the radioprotective efficacy and toxicity of 14 acylhydrazone complexes formed with copper, cobalt, and zinc. The agents in question represented complexes formed with the ligands benzoylhydrazone salicylaldehyde, butyrylhydrazone salicylaldehyde, furanoylhydrazone salicylaldehyde, thiobenzoylhydrazone salicylaldehyde, and thiobenzoylhydrazone furfural. The data indicate that a number of the complexes possessed radioprotective activities, increasing the 30-day survival rates of 7.5 Gy gamma-irradiated outbred mice to 40-65 percent, versus a control value of 8 percent. Concomitantly, the LD<sub>50</sub> values ranged from 42 to 2000 mg/kg up on intragastric or intraperitoneal administration, comparing favorably for the most part with therapeutic doses of 5 to 100 mg/kg. In general, the agents under evaluation were found to be less effective as radioprotectors than the more conventional agents, such as cystamine. However, they have been found effective in lower dosages and are generally less toxic. References 11: 3 Russian, 8 Western.

UDC 577.391.538.56

**Combined Effects of Permanent Magnetic Field and Ionizing Radiation**  
18400332d Moscow RADIOBIOLOGIYA in Russian  
Vol 28 No 5, Sep-Oct 88 (manuscript received 12 Dec 87) pp 703-706

[Article by V. I. Shein, Institute of Biomedical Problems, USSR Ministry of Health, Moscow]

[Abstract] Male and female (CBA x C57Bl/6)F<sub>1</sub> mice were used in assessing the combined effects of permanent magnetic fields and ionizing radiation on survival

rate. Six-hour exposure of the animals to 7958 A/m, 95,493 A/m, or 278,521 A/m fields was shown to have long-term sequelae in a dose-related fashion. In general leukocyte counts increased by some 300 percent and persisted at that level for 30 days with the highest-intensity magnetic field. In addition, the lymphocyte component increased by 25-30 percent, and bone marrow karyocytes showed a similar degree of elevation (30-35 percent). There was also magnetic-field-induced activation of the pituitary-adrenal endocrine axis. Gamma-irradiation of magnetic-field-pretreated animals at various periods of time after exposure to the field (20 min to 30 days), with doses ranging from 3 to 9 Gy/animal, showed prolongation of the survival times. Mice unprotected by magnetic field exposure had a mean survival time of 9.8 days after 9 Gy irradiation; whereas with the maximum-intensity magnetic-field pretreatment, the survival time was prolonged to 11 to 16 days (depending on the time of gamma-irradiation). In addition, magnetic-field pretreatment prevented lethal outcomes from exposure to the 3 and 5 Gy doses. These findings demonstrated that permanent magnetic fields were effective in enhancing the radioresistance of mice, with the most beneficial results obtained when gamma-irradiation followed the magnetic field exposure by 30 days. Figures 1; references 17: 13 Russian, 4 Western.

UDC 577.391:591.81

**Influence of Concentration of Biocomplex Co(III) With Alpha-Amino Acids and Gamma-Radiation on Conductivity of Blood Cells**

18400357A Tashkent UZBEKSKIY

BIOLOGICHESKIY ZHURNAL in Russian

No 6, Nov-Dec 88 (manuscript received 5 Feb 88) pp 3-5

[Article by P. A. Khakimov, Yu. N. Islamov, A. B. Akbarov, N. Kh. Shadiyeva, and D. Kh. Khamidov, Central Asian Medical Pediatric Institute]

[Abstract] The electrical parameters of tissues and cells depend on the physiological and functional status of the organism. Changes in these parameters are widely used to evaluate the response reactions of tissues and cells to environmental factors. The authors studied the effect of a new complex of Co(III) with vitamin U and various concentrations of alpha-amino acids (called preparation 3a) on the conductivity of erythrocytes and leukocytes in the peripheral blood after gamma-irradiation of animals. The animals were irradiated at the Institute of Nuclear Physics, Uzbek Academy of Sciences, on a gamma-installation at a dose of 3.5 Gy, power 0.0145 Gy/s. The most effective concentration of preparation 3a administered after irradiation was found to be 4 mg/kg. This concentration has a stabilizing influence on the membranes and ultrastructure of the cell and improves its functional status. References 6: Russian.



UDC 616.98:578.832.1]-092.9-07

### Stimulating Effect of Liposomes on Experimental Influenza Infection

18400366 Moscow VOPROSY VIRUSOLOGII in Russian Vol 33 No 6, Nov-Dec 88 pp 662-663

[Article by I. G. Petrova, V. A. Slepishkin, and A. G. Bukrinskaya, Central Order of Lenin Institute for Advanced Training of Physicians, Institute of Virology D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow: "Stimulating Effect of Liposomes on Experimental Influenza Infection"]

[Text] In recent years liposomes have become a familiar object, used extensively in biochemistry, biophysics, biology, and experimental pharmacology. The unique properties of liposomes made them an irreplaceable model of natural biological membranes. Thanks to these properties, liposomes are used widely in biomedical studies for the transport of substances in them through the plasma cell membrane barrier into the cytoplasm; they have been used widely in pharmacology since they promote ordinary and directional transport of medicines in the organism<sup>2</sup>.

However, many problems associated with the use of liposomes in medicine remain unsolved. An example is the phenomenon of the stimulation of experimental influenza infection, which is described in this report.

**Material and methods.** Experiments were performed on 10- to 12-g mongrel white mice. Each group contained 25 mice. The mice were infected intranasally under light ether anesthesia with type A influenza virus. We used pathogenic, for mice, recombinant R<sub>94</sub> (H3N2), 3.5 lgLD<sub>50</sub>. The recombinant, obtained by crossing A/PR/8/34 and A/Philippines/2/82 strains, were kindly provided by R. Ya. Podchernyayeva.

We prepared liposomes from egg phosphatidylcholine (Kharkov, USSR) by the reversed phases method.<sup>4</sup> We used a physiological solution, buffered by 0.01 M tris-HCl, pH 7.4, as the aqueous phase.

We prepared the liposomes directly before the experiment in an initial concentration of 10 mg/ml and diluted them up to the required concentration by physiological solution at pH 7.4. We administered the liposomes in doses from 0.005-500 ng/ml to the mice intranasally once with the virus or 24 hours after infection and then once a day for the next 2 days.

We observed the mice for 14 days. We determined the titer of the virus in a lung suspension by infecting chick embryos in order to determine the degree of influenza virus reproduction.

**Results and discussion.** As seen from the table, nearly 30 percent of the mice in the control group of infected animals died by the 14th day after infection. The introduction of liposomes intranasally in the highest concentration (500 ng/ml) did not kill the animals, but the introduction of them once with the virus produced an abrupt increase in the number of mice that died. The stimulating effect on infection was shown by a 0.005-ng/ml and higher concentration of liposomes, which killed from 65 percent to 100 percent of the mice. Administering the liposomes with the virus had approximately the same stimulating effect on infection after 24 hours. Addition of the liposomes decreased the survival time 1.5-2 times on the average.

In order to determine the cause of death of the infected mice after administration of the liposomes, we determined the infectious titer of the virus in a suspension of lung tissue of mice 48 hours after injection of the virus (3.5 lg LD<sub>50</sub>/0.05 ml) and liposomes (10 mg/ml). The virus titer in the lungs was 10<sup>5.5</sup> ID<sub>50</sub>/0.2 ml. After administration of the virus without the liposomes, this titer equalled 10<sup>4.5</sup> ID<sub>50</sub>/0.2 ml.

### Effect of Liposomes on Influenza Infection in Mice

Material Administered	Liposome Concentration, ng/ml	Percent of Deaths in 14 Days	Average Length of Survival, Days
Virus R <sub>94</sub>	—	29	12.6
Liposomes	500	0	14.0
Liposomes with virus	5x10 <sup>-5</sup>	31	12.1
	5x10 <sup>-4</sup>	43	12.0
	5x10 <sup>-3</sup>	67	11.9
	5x10 <sup>-2</sup>	92	7.5
	5x10 <sup>-1</sup>	87	7.8
	5	81	8.8
	50	88	8.2
	500	100	6.5
Liposomes 24 hours after infection	500	94	6.7

Results of the study confirm the stimulating effect of liposomes on experimental influenza infection. We saw analogous results after the administration of liposomes with incorporated specific receptors for influenza virus, gangliosides, to mice infected with influenza.<sup>1</sup> This result may be explained by the increase in the receptor capacity of epithelial cells of the upper respiratory tract. It is common knowledge that liposomes may mix with the cell plasma membrane.<sup>2,3</sup> and thus increase the concentration of the receptor molecules at the surface of the cells sensitive to the virus. Accelerated destruction of the animals after the use of liposomes without incorporated virus receptors indicates that there are other methods of stimulating infection. Such an effect may be explained by destabilization of the lipid bilayer of the plasma cell membranes under the effect of liposomes; this arises as a result of intensification of endocytosis or

fusion of the membranes.<sup>2,3</sup> These processes may increase the effectiveness of penetration of the virus into the cell. An effect of other still unknown factors is possible. The infection-stimulating effect after administration of the liposomes was observed after the infection of tissue culture by other viruses (rotaviruses, parainfluenza virus of the 3d type, and others). These features of the effect of liposomes on influenza infection serve as an alarm to prevent possible complications during senseless the use of liposomes in medicine.

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UDC 576.858.9:578.2

#### Inhibition of Viral Infections With Photoimmunotoxin

18400349c Moscow *DOKLADY AKADEMII NAUK SSSR in Russian* Vol 304 No 5, Feb 88 (manuscript received 9 Jun 88) pp 1258-1261

[Article by A. P. Savitskiy, A. I. Turkin, Ye. V. Turkina, T. V. Cherednikova, G. V. Ponomarev and B. F. Pogla-zov, Institute of Biochemistry imeni A. N. Bakh, USSR Academy of Sciences, Moscow]

[Abstract] A photoimmunotoxin was prepared which was found capable of inactivating T4 bacteriophages, consisting of dimethoxyporphyrin coupled covalently to rabbit antibodies directed against the phage. The rationale was based on the assumption that illumination of the photoimmunotoxin would lead to the formation of singlet oxygen with its adverse effects on the target phage. Plaque assays confirmed the hypothesis with a preparation containing 2.5:1 dimethoxyporphyrin:antibody molecule ratio (2.5:1 immunotoxin). Studies with the 2.5:1 immunotoxin showed that illumination of the bacteriophage preparation for 15 min after pretreatment with the 2.5:1 immunotoxin in a concentration of  $10^{-7}$  M completely abolished infectivity. A 30 percent reduction in infectivity was obtained with  $10^{-8}$  M 2.5:1 toxin, while at a concentration of  $10^{-9}$  M the photoimmunotoxin was ineffective. Studies with photoimmunotoxins with ratios of 1.4:1 and 0.79:1 showed that the efficacy in inactivating T4 phage was directly related to the number of

dimethoxyporphyrin molecules coupled per antibody molecule. Electron micrographs of the inactivated bacteriophages suggested that singlet oxygen initiated DNA ejection. These findings suggest that a similar approach may be viable in the inactivation of viruses responsible for animal infections. Figures 2; references 10: 3 Russian, 7 Western.

UDC 615.339.576

#### Interferon-Inducing Activity of Fluorenone Derivatives

18400357b Tashkent *UZBEKSKIY BIOLOGICHESKIY ZHURNAL in Russian* No 6, Nov-Dec 88 (manuscript received 16 May 88) pp 5-9

[Article by A. M. Sayitkulov, Kh. A. Khalmuratov, S. A. Auyelbekov, and Kh. A. Aslanov, Tashkent Order of Labor Red Banner State University imeni V. I. Lenin]

[Abstract] Interferon induction by tilorone hydrochloride in primates is caused by toxic or subtoxic doses. A search has been made for new interferon inducers with low toxicity, no side effects, and the ability to stimulate the formation of high concentrations of interferon. Results are presented from a study of the specific activity of new fluorene and fluorenone derivatives in cell cultures and in experimental mice and white mouse embryos as well as chick embryo fibroblasts. Twelve derivatives of fluorenone-2,7-bis-(piperidinoacetyl-amino) fluorenone-9-OH were studied. The results indicate that the greatest interferon-inducing activity was that of 2,7-bis-(anabasinoacetyl-amino) fluorenone-9-OH, 2,7-bis-(diethylaminoacetyl-amino) fluorenone-9-OH, and 2,7-bis-(2-diethylamino) ethoxyfluorene-9-OH, or tilorone hydrochloride. The cytotoxic effect of the preparations was also studied, and the least toxic was found to be tilorone hydrochloride. All of the preparations have a clear protective effect, which indicates that fluorenone derivatives containing fragments of natural compounds have interferon-inducing activity and that treating cell cultures with them leads to antiviral resistance. References 8: 4 Russian, 4 Western.

UDC 616.153.962.4-097:578.828.6]-07:616.155.32

#### Lymphocyte Subpopulations in Individuals Positive for HIV Antibody

18400367b Moscow *VOPROSY VIRUSOLOGII in Russian* Vol 35 No 6, Nov-Dec 88 (manuscript received 17 Mar 88) pp 697-699

[Article by G. I. Savitskiy, N. N. Zhilina, I. L. Alekseyeva, K. V. Morgunov, Ye. P. Shumay, A. A. Kushch, N. A. Malyshev, V. F. Krylov, N. A. Farber, V. M. Stakhanova, S. A. Arakelov and Ye. S. Ketiladze, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow]

[Abstract] The lymphocyte subpopulations of 16 individuals positive for HIV antibodies were investigated

with monoclonal antibody reagents, for comparison with the pattern obtained with 20 negative control subjects. Statistically significant differences were observed in the case of helper cells and suppressor cells: the helper cells were depressed in the subjects positive for HIV antibody, and the suppressor cells elevated, by comparison with the levels in control subjects. As a result, the helper:suppressor ratio of 1.73 found for the control subjects was less than unity in the HIV antibody positive individuals. Expression of the Ia antigen was also elevated on lymphocytes in the experimental group, as compared with the control group, as were the counts of IgM-producing B-lymphocytes. In general, the changes in lymphocyte subpopulations that differentiated the normal and HIV-positive subjects were more pronounced in the HIV carriers with lymphadenopathy. These observations point to early manifestations of an altered immune status in subjects exposed to HIV before frank symptoms of AIDS appear. References 9: 1 Russian, 8 Western.

UDC 616-092:612.017.1-064]-022.7:578.828.6]-07:616.153.962.4-097:078.33

#### Use of Native and Recombinant HIV Antigens in Immunoblotting of Sera

18400367c Moscow VOPROSY VIRUSOLOGII in Russian Vol 35 No 6, Nov-Dec 88 (manuscript received 21 Apr 85) pp 700-703

[Article by M. I. Bukrinskiy, A. Yu. Zlobin, S. A. Arakelov, S. A. Popov, S. A. Chaplinskas, V. F. Yeremin, M. N. Korneyeva, D. N. Nosik, I. A. Rudneva, E. V. Karamov, P. G. Rytik, V. M. Stakhanova and L. V. Uryvayev, Institute of Virology imeni D. I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow; Belorussian Scientific Research Institute of Epidemiology and Microbiology, Belorussian SSR Ministry of Health, Minsk]

[Abstract] Immunoblotting has been shown to be a powerful confirmatory tool for individuals shown testing positive for HIV antibodies by ELISA. However, one of the most important factors limiting the application of serological immunoblotting is the requirement of tissue culture-grown HIV, a problem that can be circumvented by reliance on genetically engineered HIV antigens. Accordingly, recombinant vaccinia virus, vC5, bearing the HIV-Igag gene, was grown in human lymphoblastoid line H9/IIIB and shown to express a single polypeptide chain of interest with an MW of 50 kD designated as rp50. Furthermore, rp50 was shown to bear the epitopes p17,

p24, and p55 of HIV. Trials with 100 sera that were positive for HIV antibody in ELISA, as well as with 50 negative sera, showed that immunoblotting relying on the rp50 antigen identifies antibodies reacting with HIV core antigens and may be used for diagnosis of asymptomatic HIV carriers. In particular, positive immunoblotting results were obtained with sera bearing antibodies against the gag and env gene products. Serum samples containing no antibodies, or low levels of antibodies, against p17, p24, and p55 either reacted weakly or gave negative results in immunoblotting with rp50; while sera possessing antibodies against gp41, gp120, and gp160 (products of env gene) were positive in immunoblotting tests with rp50. While current practices hold that immunoblotting studies yielding positive results with sera containing antibodies directed at nucleocapsid proteins and core antigens are regarded as "positive," risk factors and donor results indicate that serum samples reacting only with nucleocapsid antigens may well be false positive. Figures 3; references 11: 2 Russian, 9 Western.

UDC 616-092:612.017.1-064]-022.7:578.828.6]-036.15-078.333

#### Possibility of Abatement of Anti-HIV Antibody in Individuals Without Clinical Signs of AIDS

18400369b Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 12, Dec 88 (manuscript received 23 Feb 88) pp 62-67

[Article by Yu. P. Reznikova, T. S. Topoleva, T. I. Irova and A. L. Liozner, USSR Ministry of Health, Moscow]

[Abstract] Extensive studies were conducted on donors and individuals from areas endemic for AIDS to monitor the status of anti-HIV antibodies over a course of time, utilizing tests developed by different pharmaceutical companies (Abbott, Wellcome, Behring, DuPont, Organon, Electro-Nucleonics, Labsystems Oy, Peptoscreen). In conjunction with the Western Blot technique, the results of the various radioimmunoassays, including ELISA, demonstrated that in some cases fluctuations in the titers of the antibody were encountered, in two cases leading to disappearance of detectable antibodies over a period of 2 weeks to 2.5 months. These observations, conducted on individuals that remained asymptomatic, delineated the difficulties in assessing the health status of subjects who had at one time tested positive with subsequent seroconversion to negativity. However, it is clear that simultaneous testing with at least two different diagnostic kits is mandated, and preferably confirmation should be provided by immunoblotting. Figures 1; references 8 (Western).



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